NASA SP-7041 (08)

EARTH RESOURCES

A CONTINUING BIBLIOGRAPHY WITH INDEXES

ISSUE 8

APRIL 1976

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA SP-7041(08) Earth Resources Pages 217-272 APRIL 1976

PREVIOUS EARTH RESOURCE BIBLIOGRAPHIES

Remote Sensing of Earth Resources	(NASA SP-7036(01))
Earth Resources	(NASA SP-7041(01))
Earth Resources	(NASA SP-7041(02))
Earth Resources	(NASA SP-7041(03))
Earth Resources	(NASA SP-7041(04))
Earth Resources	(NASA SP-7041(05))
Earth Resources	(NASA SP-7041(06))
Earth Resources	(NASA SP-7041(07))

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NASA SP-7041 (08)

EARTH RESOURCES

A Continuing Bibliography
With Indexes
Issue 8

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced between October 1975 and December 1975 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

Scientific and Technical Information Office
APRIL 1976
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington, D.C.

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INTRODUCTION

The technical literature described in this continuing bibliography may be helpful to researchers in numerous disciplines such as agriculture and forestry, geography and cartography, geology and mining, oceanography and fishing, environmental control, and many others. Until recently it was impossible for anyone to examine more than a minute fraction of the earth's surface continuously. Now vast areas can be observed synoptically, and changes noted in both the earth's lands and waters, by sensing instrumentation on orbiting spacecraft or on aircraft.

This literature survey lists 351 reports, articles, and other documents announced between October and December 1975 in *Scientific and Technical Aerospace Reports (STAR)*, and *International Aerospace Abstracts (IAA)*.

The coverage includes documents related to the identification and evaluation by means of sensors in spacecraft and aircraft of vegetation, minerals, and other natural resources, and the techniques and potentialities of surveying and keeping up-to-date inventories of such riches. It encompasses studies of such natural phenomena as earthquakes, volcanoes, ocean currents, and magnetic fields; and such cultural phenomena as cities, transportation networks, and irrigation systems. Descriptions of the components and use of remote sensing and geophysical instrumentation, their subsystems, observational procedures, signature and analyses and interpretive techniques for gathering data are also included. All reports generated under NASA's Earth Resources Survey Program for the time period covered in this bibliography will also be included. The bibliography does not contain citations to documents dealing mainly with satellites or satellite equipment used in navigation or communication systems, nor with instrumentation not used aboard aerospace vehicles.

The selected items are grouped in nine categories. These are listed in the Table of Contents with notes regarding the scope of each category. These categories were especially chosen for this publication, and differ from those found in *STAR* and *IAA*.

Each entry consists of a standard bibliographic citation accompanied by an abstract. The citations and abstracts are reproduced exactly as they appeared originally in *STAR*, or *IAA*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the variation in citation appearance.

Under each of the nine categories, the entries are presented in one of two groups that appear in the following order:

IAA entries identified by accession number series A75-10,000 in ascending accession number order;

STAR entries identified by accession number series N75-10,000 in ascending accession number order.

After the abstract section, there are five indexes:

subject, personal author, corporate source, contract number and report/accession number.

AVAILABILITY OF CITED PUBLICATIONS

IAA ENTRIES (A75-10000 Series)

All publications abstracted in this Section are available from the Technical Information Service, American Institute of Aeronautics and Astronautics, Inc. (AIAA), as follows: Paper copies are available at $5.00 per document up to a maximum of 20 pages. The charge for each additional page is 25 cents. Microfiche[1] are available at the rate of $1.50 per microfiche for documents identified by the # symbol following the accession number. A number of publications, because of their special characteristics, are available only for reference in the AIAA Technical Information Service Library. Minimum airmail postage to foreign countries is $1.00. Please refer to the accession number, e.g., (A75-10763), when requesting publications.

STAR ENTRIES (N75-10000 Series)

One or more sources from which a document announced in *STAR* is available to the public is ordinarily given on the last line of the citation. The most commonly indicated sources and their acronyms or abbreviations are listed below. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source line.

Avail: NTIS. Sold by the National Technical Information Service to U.S. customers at the price shown in the citation following the letters HC (hard, paper, or facsimile copy). Customers outside the U.S. should add $2.50 per copy for handling and postage charges to the price shown. (Prices shown in earlier *STAR* volumes, 1962-1975, have been superseded but may be calculated from the number of pages shown in the citation. The price schedule by page count was published in *STAR* Numbers 2 and 3 of 1976, or it may be obtained from NTIS.)

Microfiche[1] is available at a standard price of $2.25 (plus $1.50 for non-U.S. customers) regardless of source or the quality of the fiche, for those accessions followed by a # symbol. Accession numbers followed by a + sign are not available as microfiche because of size or reproducibility.

Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) is available at greatly reduced unit prices. For this service and for information concerning subscription to NASA printed reports, consult the NTIS Subscription Unit.

NOTE ON ORDERING DOCUMENTS: When ordering NASA publications (those followed by the * symbol), use the N accession number. NASA patent applications (only the specifications are offered) should be ordered by the US-Patent-Appl-SN number. Non-NASA publications (no asterisk) should be ordered by the AD, PB, or other *report* number shown on the last line of the citation, not by the N accession number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy. The current price and order number are given following the availability line. (NTIS will fill microfiche requests, at the standard $2.25 price, for those documents identified by a # symbol.)

(1) A microfiche is a transparent sheet of film, 105 by 148 mm in size, containing as many as 60 to 98 pages of information reduced to micro images (not to exceed 26:1 reduction).

Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration, Public Documents Room (Room 126), 600 Independence Ave., S.W., Washington, D.C. 20546, or public document rooms located at each of the NASA research centers, the NASA Space Technology Laboratories, and the NASA Pasadena Office at the Jet Propulsion Laboratory.

Avail: ERDA Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Energy Research and Development Administration reports, usually in microfiche form, are listed in *Nuclear Science Abstracts*. Services available from the ERDA and its depositories are described in a booklet, *Science Information Available from the Energy Research and Development Administration* (TID-4550), which may be obtained without charge from the ERDA Technical Information Center.

Avail: Univ. Microfilms. Documents so indicated are dissertations selected from *Dissertation Abstracts* and are sold by University Microfilms as xerographic copy (HC) at $10.00 each and microfilm at $4.00 each regardless of the length of the manuscript. Handling and shipping charges are additional. All requests should cite the author and the Order Number as they appear in the citation.

Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed in this Introduction. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

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Avail: U.S. Patent Office. Sold by Commissioner of Patents, U.S. Patent Office, at the standard price of 50 cents each, postage free.

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England

Commissioner of Patents
U.S. Patent Office
Washington, D.C. 20231

Energy Research and Development
Administration
Technical Information Center
P.O. Box 62
Oak Ridge, Tennessee 37830

ESA - Space Documentation Service
ESRIN
Via Galileo Galilei
00044 Frascati (Rome), Italy.

Her Majesty's Stationery Office
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Bldg. 25, Denver Federal Center
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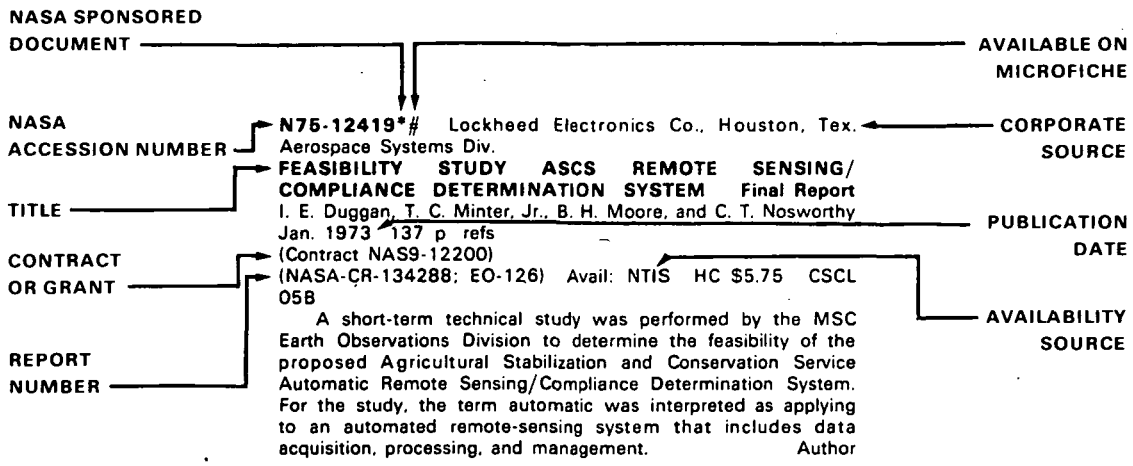
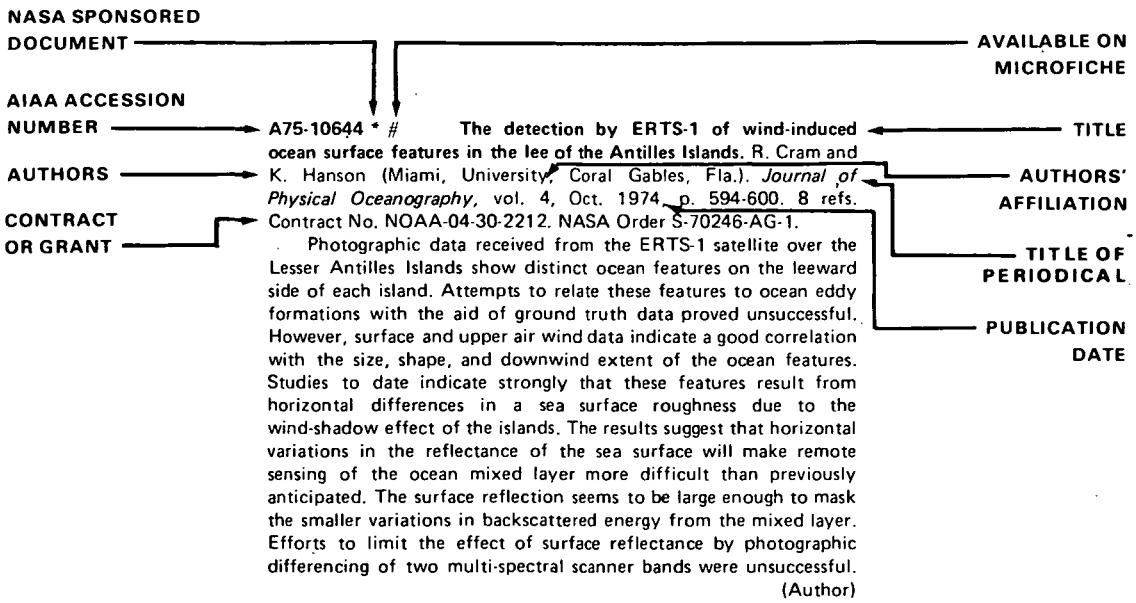
Subject Categories

Abstracts in this Bibliography are grouped under the following categories: *page:*

TYPICAL CITATION AND ABSTRACT FROM *STAR*



TYPICAL CITATION AND ABSTRACT FROM *IAA*



EARTH RESOURCES

A Continuing Bibliography (Issue 8)

APRIL 1976

01
AGRICULTURE AND FORESTRY

Include crop forecasts, crop signature analysis, soil identification, disease detection, harvest estimates, range resources, timber inventory, forest fire detection, and wildlife migration patterns.

A75-38888 ***Assessment of volume characteristics of tropical rain forests on large scale aerial photographs.*** P. J. D. Versteegh (International Institute for Aerial Survey and Earth Sciences, Enschede, Netherlands). *ITC Journal,* no. 3, 1974, p. 330-341. 5 refs.

A75-38889 **Soil erosion sequences on aerial photographs.** E. Bergsma (International Institute for Aerial Survey and Earth Sciences, Enschede, Netherlands). *ITC Journal,* no. 3, 1974, p. 342-376. 20 refs.

Soil erosion features may occur in a regular sequence of types and intensities along the hillslopes in a certain area, or in some part of the topography. The study of medium-scale aerial photographs, taken at the right season, can show the areas where an erosion sequence occurs. The presence, or absence of an erosion sequence and the kind of sequence depend on runoff conditions. This fact has implications for soil conservation and land classification. Examples are given of erosion sequences from different areas, and differentiation is made between erosion features. (Author)

A75-41446 **Agricultural, forest and range inventory using Skylab data.** R. N. Colwell (California, University, Berkeley, Calif.; Earth Satellite Corp., Washington, D.C.). In: Skylab science experiments; Proceedings of the Symposium, San Francisco, Calif., February 28, 1974. Tarzana, Calif., American Astronautical Society, 1975, p. 207-234. 10 refs.

The paper evaluates remote sensing data acquired by Skylab astronauts with the Earth Resources Experimental Package in order to determine to what extent such data may be useful in serving as inventory data relative to agricultural, forest, and range resources. Preliminary results indicate that neither automatic nor manual techniques will yield accurate classification of vegetable crops very easily, although these results were obtained on crops just emerging from the soil. Other data on mature crops not yet reported are expected to yield better classification results. A project for evaluating Skylab forest and range data on the basis of comparisons with high-altitude photographic studies is outlined. P.T.H.

A75-44607 * **Shortgrass prairie spectral measurements.** C. J. Tucker (Colorado State University, Fort Collins, Colo.; NASA, Goddard Space Flight Center, Greenbelt, Md.), L. D. Miller, and R. L. Pearson (Colorado State University, Fort Collins, Colo.). *Photogrammetric Engineering and Remote Sensing,* vol. 41, Sept. 1975, p. 1157-1162. 12 refs. NSF Grants No. GB-7824; No. GB-13096; No. GB-31862X; No. GB-31862X2; No. GB-41233X.

The spectral methods of vegetation analysis not only measure herbage biomass on a nondestructive basis but also can be adapted to aircraft and satellite devices to map the spatial distribution over an area in an efficient and economical fashion. This study reviews the ground-based in situ field spectrometry in the 0.350-0.800 micron region of the spectrum. A statistical analysis of in situ spectroreflectance data from sample plots of the shortgrass prairie shows that green biomass, chlorophyll concentration, and leaf water content are directly interrelated to that composite property of the plot which is called functioning green biomass. Spectrocorrelation data indicate the spectral regions of optimum sensitivity for a remote estimation of the green biomass, chlorophyll, and leaf water content. The near-infrared region of the spectrum shows a high positive spectrocorrelation to these three sample parameters, regardless of the amount of standing dead vegetation. S.D.

N75-28481 British Library Lending Div., Boston Spa (England). ***CRAMBE ABYSSINICA***
R. Ia. Kuznietsova [1974] 9 p Transl. into ENGLISH from Tr. Prikl. Bot. Genet. Selek. (USSR), v. 48, no. 3, 1972 p 240-245
(BLL-M-23445-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The agricultural and industrial utilization of the oilseed plant Crambe abyssinica is discussed. The chemical composition, physical characteristics, growth rate, and fruit yield of the plant are given. Growing conditions are discussed including type of soil, cultivation, and fertilization. J.M.S.

N75-28492*# Texas A&M Univ., College Station. Remote Sensing Center.
MONITORING THE VERNAL ADVANCEMENT AND RETROGRADATION (GREEN WAVE EFFECT) OF NATURAL VEGETATION Final Report, Sep. 1972 - Nov. 1974
J. W. Rouse, Jr., Principal Investigator, R. H. Haas, D. W. Deering, J. A. Schell, and J. C. Harlan Nov. 1974 371 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21857)
(E75-10354; NASA-CR-143156; RSC-1978-4) Avail: NTIS HC $10.00 CSCL 08F

The author has identified the following significant results. The Great Plains Corridor rangeland project successfully utilized natural vegetation systems as phenological indicators of seasonal development and climatic effects upon regional growth conditions. An effective method was developed for quantitative measurement of vegetation conditions, including green biomass estimates, recorded in bands 5 and 6, corrected for sun angle, were used to compute a ratio parameter (TV16) which is shown to be highly correlated with green biomass and vegatation moisture content. Analyses results of ERTS-1 digital data and correlated ground data are summarized. Attention was given to analyzing weather influences and test site variables on vegetation condition measurements with ERTS-1 data.

N75-28866 Louisiana State Univ. and A&M Coll., Baton Rouge.
INVESTIGATION OF A METHOD TO DETERMINE THE EFFECTS OF VARIABLES ON REFLECTANCE AND EMITTANCE DATA FROM NATURAL SURFACES UNDER NATURAL CONDITIONS Ph.D. Thesis
John Franklin Hagewood 1974 380 p
Avail: Univ. Microfilms Order No. 75-14252

Bidirectional reflectance data from natural surfaces was obtained by using an optically folding mirror to transfer the reflected energy from the test surface to a spectroradiometer. The folding mirror was a surface reflector made by stretching Mylar vacuum coated with aluminum over a light-weight frame. The folding mirror was positioned over the test surfaces with a

moveable platform for both laboratory and field tests. Field tests were also conducted using a tethered balloon system to position the folding mirror. A spectroradiometer capable of detecting energies in small bandwidths throughout the electromagnetic spectrum from 0.3 microns to 3.0 microns was designed and built. Bidirectional reflectance data and variations in the data with source angles were obtained from Saint Augustine grass, Bermuda grass, and a black alluvium soil from the Mississippi River delta. Dissert. Abstr.

N75-29401# Dugway Proving Ground, Utah.
AERIAL SPRAY EVALUATION PINE BUTTERFLY TEST, BITTERROOT NATIONAL FOREST, MONTANA, 1973
John W. Barry, Gary L. Sutton, Bruce S. Grim, Robert B. Ekblad, and William M. Ciesla Jan. 1975 210 p refs
(AD-A006256; DPG-DR-C620A) Avail: NTIS CSCL 06/6

The U.S. Department of Agriculture, Forest Service, conducted a pilot test in the Bitterroot National Forest, Montana, during June 1973, supported by the U.S. Army Dugway Proving Ground, Dugway, Utah. The pilot test consisted of helicopter spraying twelve 40-acre plots. Each plot had a high population level of pine butterfly (Neophasia menapia), a defoliator of the ponderosa pine. Six plots were sprayed with the insecticide Zectran and six with the microorganism, Bacillus thuringiensis. U.S. Army support included meteorological forecasting, meteorological monitoring at each plot, spray deposition sampling, deposition sampler assessment, pretest prediction modeling of spray behavior, and tracking during helicopter swathing. The report presents results and recommendations on recoveries of spray droplets, spray penetration plots of the forest canopy and discussions on droplet behavior. GRA

N75-29503*# Northern Prairie Wildlife Research Center, Jamestown, N. Dak.
UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report
David S. Gilmer, Principal Investigator Jul. 1975 3 p EREP
(NASA Order T-4114-B; Contract DI-14-16-0008-802)
(E75-10361; NASA-CR-143219) Avail: NTIS HC $3.25 CSCL 06C

N75-29504*# Pennsylvania State Univ., University Park. Office of Remote Sensing of Earth Resources.
PROCESSING ERTS AND AIRCRAFT MSS DATA WITH THE GENERAL ELECTRIC IMAGE 100 SYSTEM Interim Report
George J. McMurtry, Gary W. Petersen, Principal Investigators, B. F. Merembeck, and F. Y. Borden Jun. 1975 8 p ERTS
(Contract NAS5-23133)
(E75-10362; NASA-CR-143220; ORSER-SSEL-TR-4-75) Avail: NTIS HC $3.25 CSCL 05B

N75-29505*# Michigan State Univ., East Lansing.
INVESTIGATION OF SKYLAB DATA Progress Report
Lester V. Manderscheid, Principal Investigator Jun. 1975 1 p EREP
(Contract NAS9-13332)
(E75-10363; NASA-CR-143221) Avail: NTIS HC $3.25 CSCL 05B

N75-29506*# Pennsylvania Univ., Philadelphia. Museum Applied Science Center for Archaeology.
DETECTION OF CROP MARK CONTRAST FOR ARCHAEOLOGICAL SURVEYS Quarterly Progress Report
Bruce Bevan, Principal Investigator 8 Jul. 1975 4 p ERTS
(Contract NAS5-20792)
(E75-10364; NASA-CR-143222; QPR-2) Avail: NTIS HC $3.25 CSCL 08F

N75-29507*# Ohio Dept. of Economic and Community Development, Columbus.
OHIO SKYLAB EREP INVESTIGATION Progress Report
Paul Baldridge, Principal Investigator 30 Jun. 1975 7 p EREP
(Contract NAS3-19521)
(E75-10365; NASA-CR-143223) Avail: NTIS HC $3.25 CSCL 05B

N75-29508*# Environmental Research Inst. of Michigan, Ann Arbor.
[RECOGNITION MAP ANALYSIS AND CROP ACREAGE ESTIMATION USING SKYLAB EREP DATA] Progress Report, Feb. 1975
Lester V. Manderscheid (Michigan State Univ.), Jon D. Erickson, Principal Investigators, Richard F. Nalepka, and James P. Morgenstern 20 Mar. 1975 2 p EREP
(Contract NAS9-13332)
(E75-10366; NASA-CR-143224; ERIM-104600-34-L) Avail: NTIS HC $3.25 CSCL 05B

N75-29511*# Environmental Research Inst. of Michigan, Ann Arbor.
[RECOGNITION MAP ANALYSIS AND CROP ACREAGE ESTIMATION USING SKYLAB EREP DATA] Progress Report, Mar. 1975
Lester V. Manderscheid (Michigan State Univ., East Lansing), Jon D. Erickson, Principal Investigators, Richard F. Nalepka, and James P. Morgenstern 21 Apr. 1975 7 p ref EREP
(Contract NAS9-13332)
(E75-10369; NASA-CR-143227; ERIM-104600-36-L) Avail: NTIS HC $3.25 CSCL 05B

N75-29514*# Mississippi State Univ., State College.
APPLICATION OF REMOTE SENSING TO STATE AND REGIONAL PROBLEMS Semiannual Progress Report, 1 Nov. 1974 - 30 Apr. 1975
C. W. Bouchillon, Principal Investigator, W. Frank Miller, Jerry C. Harris, Bradley Carter, Frank D. Whisler, H. Randell Robinette, and Vic L. Zitta 30 Apr. 1975 43 p refs ERTS
(Contract NAS5-21881; Grant NGL-25-001-054)
(E75-10372; NASA-CR-143230; SAPR-3) Avail: NTIS HC $3.75 CSCL 05B

N75-29515*# Ohio Dept. of Economic and Community Development, Columbus.
OHIO SKYLAB EREP INVESTIGATION Progress Report, Apr. - May 1975
Paul Baldridge, Principal Investigator 29 May 1975 9 p EREP
(Contract NAS3-19521)
(E75-10373; NASA-CR-143232) Avail: NTIS HC $3.25 CSCL 08B

N75-29517*# Environmental Research Inst. of Michigan, Ann Arbor.
[RECOGNITION MAP ANALYSIS AND CROP ACREAGE ESTIMATION] Progress Report, Apr. 1975
Lester V. Manderscheid (Michigan State Univ., East Lansing), Jon D. Erickson, Principal Investigators, Richard F. Nalepka, and James P. Morgenstern 27 May 1975 5 p EREP
(Contract NAS9-13332)
(E75-10375; NASA-CR-143234; ERIM-104600-38-L) Avail: NTIS HC $3.25 CSCL 05B

N75-29518*# Environmental Research Inst. of Michigan, Ann Arbor.
[RECOGNITION MAP ANALYSIS AND CROP ACREAGE ESTIMATION] Progress Report, May 1975
Lester V. Manderscheid (Michigan State Univ., East Lansing), Jon D. Erickson, Principal Investigators, Richard F. Nalepka, and James P. Morgenstern 10 Jun. 1975 7 p EREP
(Contract NAS9-13332)
(E75-10376; NASA-CR-143238; ERIM-104600-40-L) Avail: NTIS HC $3.25 CSCL 05B

N75-29522*# Environmental Research Inst. of Michigan, Ann Arbor.
[RECOGNITION MAP ANALYSIS AND CROP ACREAGE ESTIMATION] Progress Report, Jun. 1975
Lester V. Manderscheid (Michigan State Univ., East Lansing), Jon D. Erickson, Principal Investigators, Richard F. Nalepka, and James P. Morgenstern 16 Jul. 1975 5 p EREP
(Contract NAS9-13332)
(E75-10380; NASA-CR-143242; ERIM-104600-42-L) Avail: NTIS HC $3.25 CSCL 05B

N75-29524*# Earth Satellite Corp., Berkeley, Calif.
A SCHEME FOR THE UNIFORM MAPPING AND MONITORING OF EARTH RESOURCES AND ENVIRONMENTAL COMPLEXES: AN ASSESSMENT OF NATURAL VEGETATION, ENVIRONMENTAL, AND CROP ANALOGS Final Report
Charles E. Poulton and Robin I. Welch, Principal Investigators Jul. 1975 280 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21830)
(E75-10382; NASA-CR-143244; G-072) Avail: NTIS HC $8.75 CSCL 08B

The author has identified the following significant results. A study was performed to develop and test a procedure for the uniform mapping and monitoring of natural ecosystems in the semi-arid and wood regions of the Sierra-Lahontan and Colorado Plateau areas, and for the estimating of rice crop production in the Northern Great Valley (Ca.) and the Louisiana Coastal Plain. ERTS-1 and high flight and low flight aerial photos were used in a visual photointerpretation scheme to identify vegetation complexes, map acreages, and evaluate crop vigor and stress. Results indicated that the vegetation analog concept is valid; that depending on the kind of vegetation and its density, analogs are interpretable at different levels in the hierarchical classification from second to the fourth level. The second level uses physiognomic growth form-structural criteria, and the fourth level uses floristic or taxonomic criteria, usually at generic level. It is recommended that analog comparisons should be made in relatively small test areas where large homogeneous examples can be found of each analog.

N75-29534*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
THE EFFECTS OF THE PHYSICAL AND CHEMICAL PROPERTIES OF SOILS ON THE SPECTRAL REFLECTANCE OF SOILS
O. L. Montgomery and M. F. Baumgardner 1974 119 p refs
(Contract NAS9-14016)
(NASA-CR-144379; LARS-IN-112674) Avail: NTIS HC $5.25 CSCL 08M

The effects of organic matter, free iron oxides, texture, moisture content, and cation exchange capacity on the spectral reflectance of soils were investigated along with techniques for differentiating soil orders by computer analysis of multispectral data. By collecting soil samples of benchmark soils from the different climatic regions within the United States and using the extended wavelength field spectroradiometer to obtain reflectance values and curves for each sample, average curves were constructed for each soil order. Results indicate that multispectral analysis may be a valuable tool for delineating and quantifying differences between soils. Author

N75-29536*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
CROP IDENTIFICATION TECHNOLOGY ASSESSMENT FOR REMOTE SENSING (CITARS). VOLUME 6: DATA PROCESSING AT THE LABORATORY FOR APPLICATIONS OF REMOTE SENSING
Marvin E. Bauer, Tina K. Cary, Barbara J. Davis, and Philip H. Swain Houston, Tex. NASA Jul. 1975 69 p refs
(Contract NAS9-14016)
(NASA-CR-144374; JSC-09389-Vol-6) Avail: NTIS HC $4.25 CSCL 02C

The results of classifications and experiments for the crop identification technology assessment for remote sensing are summarized. Using two analysis procedures, 15 data sets were classified. One procedure used class weights while the other assumed equal probabilities of occurrence for all classes. Additionally, 20 data sets were classified using training statistics from another segment or date. The classification and proportion estimation results of the local and nonlocal classifications are reported. Data also describe several other experiments to provide additional understanding of the results of the crop identification technology assessment for remote sensing. These experiments investigated alternative analysis procedures, training set selection and size, effects of multitemporal registration, spectral discriminability of corn, soybeans, and other, and analyses of aircraft multispectral data. Author

N75-30615*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PROCEEDINGS OF THE 1974 LYNDON B. JOHNSON SPACE CENTER WHEAT-YIELD CONFERENCE
David E. Pitts and Gerald L. Barger (Lockheed Electronics Co., Houston, Tex.) Apr. 1975 187 p refs Conf. held at Houston, Tex., 1974
(NASA-TM-X-58158; JSC-09256) Avail: NTIS HC $7.00 CSCL 02C

The proceedings of the 1974 Lyndon B. Johnson Space Center Wheat-Yield Conference are presented. The state of art of wheat-yield forecasting and the feasibility of incorporating remote sensing into this forecasting were discussed with emphasis on formulating common approach to wheat-yield forecasting, primarily using conventional meteorological measurements, which can later include the various applications of remote sensing. Papers are presented which deal with developments in the field of crop modelling. Author

N75-30641# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
THE CONTRIBUTION OF AGRICULTURE TO THE EUTROPHICATION OF SWISS WATERS. PART 1: RESULTS OF DIRECT MEASUREMENTS IN THE DRAINAGE AREA OF VARIOUS CHANNELS
R. Gaechter and O. J. Furrer 1975 34 p refs Transl. into ENGLISH from Schweiz. Z. fuer Hydrol. (Birkhaeuser), v. 34, no. 1, 1972 p 41-70
(NRC/CNR-TT-1809-Pt-1; ISSN-0470-2557-Pt-1) Avail: NTIS HC $3.75

Investigations were conducted to analyze the leaching and erosion of nutrients in relatively small drainage areas amenable to observation. The leaching was found to be dependent on the type of soil, the topography, the climate, and the method of cultivation. M.J.S.

N75-30642*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
A RECOGNITION KEY TO SALT MARSH MOSQUITO (AEDES SOLLICITANS) BREEDING AREAS IN SOUTH GALVESTON COUNTY
Gerald K. Arp Oct. 1974 53 p
(Contract NAS9-12200)
(NASA-CR-144404; LEC-4691) Avail: NTIS HC $4.25 CSCL 08B

Application of remote sensing technology to mosquito control is discussed. It is shown that salt marsh mosquito larvae are restricted to a single vegetation type on the Texas gulf coast. Multispectral aerial photography or multispectral scanner data are used to identify this zone for spraying. J.M.S.

N75-31554*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
RESEARCH IN REMOTE SENSING OF AGRICULTURE, EARTH RESOURCES, AND MAN'S ENVIRONMENT Final Report
D. A. Landgrebe 1975 166 p refs
(Contract NAS9-14016)
(NASA-CR-144426) Avail: NTIS HC $6.25 CSCL 02C

Progress is reported for several projects involving the utilization of LANDSAT remote sensing capabilities. Areas under study include crop inventory, crop identification, crop yield prediction, forest resources evaluation, land resources evaluation and soil classification. Numerical methods for image processing are discussed, particularly those for image enhancement and analysis. D.M.L.

N75-31698# Kiel Univ. (West Germany).
PRODUCTION OF MARITIME ORGANISMS UNDER NATURAL CONDITIONS AND IN CULTURES [DIE PRODUKTION MARINER ORGANISMEN UNTER NATUERLICHEN BEDINGUNGEN UND IN KULTUREN]
Peter H. Koske, Juergen Lenz, Walter Nellen, and Bernt Zeitzschel Bonn Bundesmin. fuer Forsch. u. Technol. Apr. 1975 99 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-M-75-01) Avail: NTIS HC $4.75; ZLDI, Munich DM 20.80

The production efficiency achieved so far in the field of marine aquaculture is compared with productivity under natural conditions in the ocean. The chief ecological factors limiting natural productivity are pointed out and the problems and potentialities of aquaculture on various levels of the food chain are discussed. Attention is focussed on unicellular algae as primary producers, herbivorous zooplankton as secondary producers, and the final products mussels, fish, and shrimps, which rely on both food levels and which are used for human consumption. The fourth chapter describes the general laws governing growth in cultured organisms as demonstrated by phytoplankton algae are described. The accumulation of toxic substances in the biomass produced is touched upon. Author (ESRO)

N75-32575*# Lockheed Electronics Co., Plainfield, N.J.
CROP IDENTIFICATION TECHNOLOGY ASSESSMENT FOR REMOTE SENSING. (CITARS) VOLUME 9: STATISTICAL ANALYSIS OF RESULTS
Barbara J. Davis and Alan H. Feiveson Sep. 1975 113 p
(Contract NAS9-12200)
(NASA-CR-144458; LEC-4326G-Vol-9; JSC-09392) Avail: NTIS HC $5.25 CSCL 02C

Results are presented of CITARS data processing in raw form. Tables of descriptive statistics are given along with descriptions and results of inferential analyses. The inferential results are organized by questions which CITARS was designed to answer. Author

N75-33450*# South Dakota State Univ., Brookings. Remote Sensing Inst.
DEVELOP TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS, TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL Monthly Progress Report, May 1975
Victor I. Myers, Principal Investigator 20 Jun. 1975 2 p EREP
(Contract NAS9-13337)
(E75-10395; NASA-CR-144390) Avail: NTIS HC $3.25 CSCL 08M

N75-33451*# South Dakota State Univ., Brookings. Remote Sensing Inst.
DEVELOP TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL Monthly Progress Report, Jun. 1975
Victor I. Myers, Principal Investigator 20 Jul. 1975 2 p EREP
(Contract NAS9-13337)
(E75-10396; NASA-CR-143389) Avail: NTIS HC $3.25 CSCL 05B

N75-33452*# South Dakota State Univ., Brookings. Remote Sensing Inst.
DEVELOPMENT TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS, TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL Monthly Progress Report, Jul. 1975
Victor I. Myers, Principal Investigator 20 Aug. 1975 2 p EREP
(NAS9-13337)
(E75-10397; NASA-CR-143388) Avail: NTIS HC $3.25 CSCL 05B

N75-33463*# Mississippi Test Facility, Bay St. Louis.
APPLICATION OF REMOTE SENSING FOR FISHERY RESOURCE ASSESSMENT AND MONITORING Progress Report, 1-31 Jul. 1975
Kenneth Savastano, Principal Investigator 31 Jul. 1975 3 p refs EREP
(Contract NASA Order T-8217-B)
(E75-10408; NASA-CR-143401; PR-19) Avail: NTIS HC $3.25 CSCL 08A

N75-33574# California Inst. of Tech., Pasadena. Earthquake Engineering Lab.
ANALYSES OF STRONG MOTION EARTHQUAKES ACCELEROGRAMS. VOLUME 3: RESPONSE SPECTRA. PART S: ACCELEROGRAMS IIS255 TO IIS273
M. D. Trifunac, A. G. Brady, and D. E. Hudson Oct. 1974 251 p refs
(Grant NSF GI-28098)
(PB-241553/7; EERL-74-86-Vol-3) Avail: NTIS HC $8.50; HC also available from NTIS $31.00/set of 4 reports as PB-241550-SET CSCL 08K

This is one of a series of reports presenting earthquake response spectrum curves calculated from corrected accelerograms are presented. In the preface to the first part, Vol. 3, Part A, Report No. EERL 72-80, there is a summary of response spectrum techniques in earthquake engineering which is available as background material for the data. For each earthquake accelerogram, two spectrum plots are given-relative velocity response versus period on a linear scale, and a tripartite log-log plot giving relative displacement pseudo-velocity, and pseudo-acceleration spectra. The Fourier spectrum is also shown on the linear plot. Digital printout of ordinates of the plotted curves are tabulated for each earthquake. The records analyzed in this report, Vol. 3, Part S, are the corrected accelerogram records contained in Vol. 2, Part S, Report No. EERL 74-57, and appeared in their uncorrected form in Vol. 1, Part S, Report No. EERL 73-24. GRA

02

ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

Includes land use analysis, urban and metropolitan studies, environmental impact, air and water pollution, geographic information systems, and geographic analysis.

A75-38854 # **A Canadian ERTS program - A progress report.** L. W. Morley and A. K. McQuillan (Department of Energy, Mines, and Resources, Canada Centre for Remote Sensing, Ottawa, Canada). *Canadian Journal of Remote Sensing*, vol. 1, May 1975, p. 4-7. 9 refs.

Applications of ERTS data are considered, taking into account experiments and quasi-operational projects. Attention is given to Great Lakes Basin land use mapping, a coast resource inventory, cartographic mapping, sea ice monitoring, a broad-brush northern resource inventory, and environmental monitoring. An evaluation is conducted of the potential benefits of ERTS imagery to Canada. The data based on ERTS imagery when combined with other sources of information can be expected to make a substantial contribution to the balanced development of northern Canada. G.R.

A75-38894 **USEMAP.** C. A. de Bruijn (International Institute for Aerial Survey and Earth Sciences, Enschede, Netherlands). *ITC Journal*, no. 3, 1974, p. 445-470. 23 refs.

The project USEMAP (Urban Surveys Experimental Method for Analyzing Photo-interpretation data) has the objective to develop an operational system for the interpretation of photographs of urban areas. Basic USEMAP characteristics are considered, taking into account the choice of the grid system, the size of the grid cell, and the computer base. Attention is given to the results obtained with the first operational system developed and to the performance of a second improved version. G.R.

A75-38896 **Landuse surveys in city centres.** V. F. L. Polle (International Institute for Aerial Survey and Earth Sciences, Enschede, Netherlands). *ITC Journal*, no. 4, 1974, p. 490-505. 22 refs.

This article summarizes ITC experience in land use surveys in city centers. The inventories were made in cities with up to 750,000 inhabitants. The different techniques and procedures are described, and the role of aerial photographs in the inventories discussed. (Author)

A75-39112 # **Variations of the turbulent fluxes of momentum, heat and moisture over Lake Ontario.** G. A. McBean and R. D. Paterson (Atmospheric Environment Service, Toronto, Canada). *(International Association of Meteorology and Atmospheric Physics and International Association for the Physical Sciences of the Ocean, Special Assembly, 1st, Melbourne, Australia, Jan. 14-25, 1974.) Journal of Physical Oceanography*, vol. 5, July 1975, p. 523-531. 10 refs.

During the International Field Year on the Great Lakes, measurements of turbulence and turbulent fluxes were made with an instrumented jet aircraft. After removing effects of aircraft motion the fluxes were computed by the eddy correlation method. Flights were made along the north shore, along the center of the lake, and across the shoreline on four days in October 1972 at a flight level of about 150 m. In addition, flights were made at levels 30, 60, 150 and 300 m over one location on the lake. The horizontal variations in the fluxes at 150 m above the surface are illustrated and their relationship to the surface pattern discussed. It was found that the 150 m pattern was displaced downstream about 15 km. (Author)

A75-39113 # **The spatial and temporal variations of the turbulent fluxes of heat, momentum and water vapor over Lake Ontario.** B. R. Bean, C. B. Emmanuel, R. O. Gilmer, and R. E. McGavin (NOAA, Environmental Research Laboratories, Boulder, Colo.). *Journal of Physical Oceanography*, vol. 5, July 1975, p. 532-540. 9 refs.

A75-39303 **Simultaneous vertical profiles of condensation nuclei and ozone in the lower troposphere.** M. Schmidt, P. Fabian, and H. Tiefenau (Max-Planck-Institut für Aeronomie, Lindau über Northeim, West Germany). *(European Geophysical Society, Symposium on Trace Substances in the Atmosphere from Source to Sink, Trieste, Italy, Sept. 23, 24, 1974.) Pure and Applied Geophysics*, vol. 112, no. 6, 1974, p. 887-899. 10 refs.

Eight vertical profiles compiled from simultaneous measurements of Aitken nuclei and ozone concentrations over Germany in different weather conditions are discussed. The position and shape of the profiles is shown to depend on the prevailing weather conditions and the type of air masses. High aerosol concentrations in smoke plumes correlate in some cases with lower ozone concentrations, indicating that ozone in such cases is destroyed in the presence of high concentrations of pollutants such as aerosols and gases. A layered structure in the profiles was found only in association with temperature inversions and where the air above 2 km was subsiding, and was not found in convective parts of the troposphere. (Author)

A75-39610 * **Element concentrations from lunar orbital gamma-ray measurements.** A. E. Metzger (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.), J. I. Trombka (NASA, Goddard Space Flight Center, Greenbelt, Md.), R. C. Reedy (California, University, Los Alamos, N. Mex.), and J. R. Arnold (California, University, La Jolla, Calif.). In: Lunar Science Conference, 5th, Houston, Tex., March 18-22, 1974, Proceedings. Volume 2. New York, Pergamon Press, Inc., 1974, p. 1067-1078. 18 refs. Contracts No. NAS7-100; No. NAS9-10670.

We report the concentrations of Th, K, Fe, Mg, and Ti in 28 geographic regions overflown by the Apollo 15 and 16 spacecraft, as determined by gamma-ray spectrometry. The observed chemical compositions are consistent with ground truth, and the two missions give reasonable agreement in a region observed by both. The chemical compositions observed require a more complex model for interpretation than the previously reported radioactivity maps. Both highlands and maria show significant variations in composition. The van de Graaff region is unique; it may possibly be the source region for 'granitic' materials such as rock 12013. (Author)

A75-40185 # **Aerosol sounding by lidar.** A. Hagard (Forsvarets Forskningsanstalt, Stockholm, Sweden). In: European Electro-Optics Markets and Technology Conference, 2nd, Montreux, Switzerland, April 2-5, 1974, Proceedings. St. Albans, Herts., England, Mack Brooks Exhibitions, Ltd., 1975, p. 139-146. 8 refs.

The most obvious application of optical radar involves the detection of elastic light scattering from particles in the atmosphere. Optical radar can, therefore, be employed to obtain an image of the spatial distribution of particles. Slant visibility measurements with optical radar are reported and vertical aerosol sounding experiments with optical and acoustic radar are discussed. Attention is given to basic scattering information, operational and design information concerning the optical radar, and the aerosol distribution model obtained. G.R.

A75-41444 **Land use studies with Skylab data.** W. G. Rohde and D. S. Simonett (Earth Satellite Corp., Washington, D.C.). In: Skylab science experiments; Proceedings of the Symposium, San Francisco, Calif., February 28, 1974. Tarzana, Calif., American Astronautical Society, 1975, p. 127-185. 11 refs.

This study reports on preliminary analyses of Skylab space photography and multispectral scanner data. S-190A and S-190B

high resolution color and color infrared photography have been evaluated for ways in which they may complement ERTS data in land use mapping and for detailed land use sampling studies in regional resource surveys. Capabilities of Skylab photographic data suggest significant applications for: (1) identification and mapping of all primary, most secondary, and many tertiary land use classes; (2) stratification of the landscape for more detailed sampling; and, (3) rapid updating of existing land use and vegetation maps subscaled at 1:25,000 and smaller with manual interpretation techniques. Automated thematic mapping of land use categories with electronic data processing techniques is feasible with the S-192 Multispectral Scanner, despite the high noise levels in many channels. (Author)

A75-42666 * # **Some environmental problems and their satellite monitoring.** J. Otterman (Tel Aviv University, Tel Aviv, Israel; NASA, Goddard Space Flight Center, Greenbelt, Md.). *British Interplanetary Society, Journal,* vol. 28, Sept.-Oct. 1975, p. 613-623. 38 refs.

Anthropogenic modification of the earth's surface is discussed in two problem areas: (1) land use changes and overgrazing, and how it affects albedo and land surface-atmosphere interactions, and (2) water and land surface pollution, especially oil slicks. A literature survey evidences the importance of these problems. The need for monitoring is stressed, and it is suggested that with some modifications to the sensors, ERTS (Landsat) series satellites can provide approximate monitoring information. The European Landsat receiving station in Italy will facilitate data collection for the tasks described. (Author)

A75-42668 # **Water quality studies and land-use mapping using ERTS-1 data.** U. Hellden and H.-A. Olsson (Lund, Universitet, Lund, Sweden). *British Interplanetary Society, Journal,* vol. 28, Sept.-Oct. 1975, p. 634-646. 15 refs.

In order to investigate the possibility of using ERTS-1 MSS images for environmental studies with special reference to water quality studies and land-use mapping, test areas in south and middle Sweden and adjoining water areas have been selected. The possibility of tracing pollution plumes is studied in the Oresund outside Copenhagen. The effect of different sewers and the circulation of the polluted water is analyzed in various situations. In the southern part of the Baltic a possible belt of oil has been detected and observed for two consecutive days. The variation in reflectivity of a great number of lakes is studied and significant regional differences are found. At the request of planners, the utility of ERTS imagery for land use inventory was studied. The land-use map constructed gives a very detailed differentiation (18 categories) of the surveyed coastal area. (Author)

A75-42772 * **Interpretation of an urban scene using multi-channel radar imagery.** M. L. Bryan (Michigan, Environmental Research Institute, Ann Arbor, Mich.). *Remote Sensing of Environment,* vol. 4, no. 1, 1975, p. 49-66. 17 refs. Research supported by the Environmental Research Institute of Michigan Internal Research and Development Fund; Contract No. NAS10-8333.

Four channel, SLAR imagery was studied by a group of individuals having no previous experience with either SLAR imagery or the urban area under scrutiny. This tactic was used because it was desired to define the nature of training needed when introducing people to radar imagery of urban scenes. Responses resulting from interpretations based on standard photointerpretation methods were subjected to a Chi-square analysis to determine the level of significance of the interpretations. For the urban scene studied, and for the two wavelengths (X /3.0 cm/ and L /23.0 cm/ Band) and polarizations (HH and HV) used, several types of urban land use were easily and accurately identified. It is shown that little formal training is required for obtaining quite high interpretation accuracies from multi-channel radar images of some urban scenes. (Author)

A75-42774 **Observations of wind streaklines over the Red Sea from the ERTS-1 imagery.** J. Otterman (Tel Aviv University, Tel Aviv, Israel). *Remote Sensing of Environment,* vol. 4, no. 1, 1975, p. 79-94. 24 refs.

Observations are reported of differences in radiance levels over the Red Sea in the scanner imagery from the Earth Resources Technology Satellite, now called Landsat-1. Two types of effects are observed: narrow streaks of lower radiance extending for up to 100 km leeward from islands or mountains near the shore (referred to as lee-lines); and striations of alternate darker and lighter bands, each up to 1 km broad. Two interpretations are discussed, of local sea-state differences and of local differences in the dust levels in the atmosphere. In the sea-state differences interpretation, the darker regions correspond to a lower sea-state linked to lower wind velocity. However, objections can be raised to the sea-state differences interpretation and it is suggested that the dust level differences in the atmosphere offer the correct interpretation. (Author)

A75-44141 # **The study of the radiation environment in near-earth space.** V. M. Petrov, Y. A. Akatov, S. B. Kozlova, V. V. Markelov, V. M. Nesterov, V. I. Redko, L. N. Smirennyi, A. V. Khortsev, and I. V. Chernikh (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR). In: Life sciences and space research XIII; Proceedings of the Seventeenth Plenary Meeting, São Paulo, Brazil, June 17-July 1, 1974. Berlin, East Germany, Akademie-Verlag GmbH, 1975, p. 129-134. 10 refs.

Results of daily radiation dose measurements in near-earth space are presented and analyzed. It is concluded that (1) dose depends on apogee altitude and inclination, as well as solar activity cycle period (during solar minimum the doses increase by a factor of about two); (2) increasing the shield thickness does not greatly decrease the dose rate; (3) the major portion of the doses is contributed by the high-energy protons of the galactic cosmic rays and radiation belt in the South Atlantic Anomaly; and (4) it is relatively safe to orbit with inclinations of less than 62 deg and apogees of less than 350 km, provided there are no strong solar flares. S.J.M.

A75-44402 # **Cloud droplet measurements in cumuliform and stratiform clouds.** M. G. Fowler, H. H. Blau, Jr., and E. W. Fasci, Jr. (Environmental Research and Technology, Inc., Lexington, Mass.). In: Conference on Cloud Physics, Tucson, Ariz., October 21-24, 1974, Proceedings. Boston, American Meteorological Society, 1975, p. 296-299. 5 refs.

A cloud particle spectrometer was flown on the NASA Convair 990 over the Caribbean Sea and Pacific Ocean in 1972 and over the Bering Sea in 1973. A large number of cloud droplet spectra were collected during these experiments in both frontal and isolated clouds. These measurements have been analyzed to determine representative droplet spectra for stratus, stratocumulus and cumulus and to provide corresponding values of liquid water content and cloud particle density. (Author)

A75-44425 # **Air motions and cloud structure in a frontal system in the Pacific Northwest.** P. V. Hobbs, R. A. Houze, Jr., and T. J. Matejka (Washington, University, Seattle, Wash.). In: Conference on Cloud Physics, Tucson, Ariz., October 21-24, 1974, Proceedings. Boston, American Meteorological Society, 1975, p. 418-423. 23 refs. NSF Grants No. GI-31759; No. GA-40806.

A mesoscale frontal cloud band associated with a West Coast occlusion is studied to describe the dynamical structure of the frontal system, to diagnose the dynamical and microphysical structure of frontal clouds and to evaluate the modifications of the frontal dynamics and cloud structure as the system passed over the Cascade Mountains. The inferred dynamical structure provides a basic framework for interpretation of airborne cloud microphysical measurements, showing that the mesoscale precipitation band is characterized by high concentrations of ice particles. It is shown that both frontal and orographic lifting play significant parts in the precipitation processes of the frontal system as it passed over the Cascade Mountains, and that the topography of the mountain range interferes with the frontal cloud dynamics by effectively cutting off the low-level moisture source of the cloud band before it reached the leeward slope of the range. S.D.

A75-45099 * # **Stellar refraction - A tool to monitor the height of the tropopause from space.** D. W. Schuerman, F. Giovane, and J. M. Greenberg (Dudley Observatory; New York, State University, Albany, N.Y.). *Journal of Applied Meteorology,* vol. 14, Sept. 1975, p. 1182-1186. 7 refs. Contract No. NAS9-12539.

Calculations of stellar refraction for a setting or rising star as viewed from a spacecraft show that the tropopause is a discernible feature in a plot of refraction vs time. The height of the tropopause is easily obtained from such a plot. Since the refraction suffered by the starlight appears to be measurable with some precision from orbital altitudes, this technique is suggested as a method for remotely monitoring the height of the tropopause. Although limited to nighttime measurements, the method is independent of supporting data or model fitting and easily lends itself to on-line data reduction. (Author)

A75-46716 **Identification of the boundary layer formed in the vicinity of the earth-sea discontinuity (Identification de la couche limite formée au voisinage de la discontinuité terre-mer).** C. Allet, M. Ravaut, J.-C. Semiond (Institut National d'Astronomie et de Géophysique, Meudon, Hauts-de-Seine, France), J.-P. Pages, J. Saissac, and M. Vergez (Pic-du-Midi, Observatoire; Toulouse, Observatoire, Bagnères-de-Bigorre, Hautes-Pyrénées, France). *Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques,* vol. 281, no. 5-8, Aug. 4-25, 1975, p. 121-124. In French.

Meteorological parameters at seven altitude levels in the vicinity of the coast line at Grau de Vendres on the Mediterranean Sea were recorded during an airplane flight around noon. A parameter was chosen whose invariance most completely reflected the adiabatic evolution of a humid atmospheric particle. The parameter, which can be called the generalized potential temperature, is a function of absolute temperature, the mixing ratio, latent heat of evaporation, specific heat at constant pressure for dry air, partial pressure of dry air, and the specific constant for ideal gases. The potential temperature was plotted on a vertical section normal to the coast line at a given point and extending from 8 km at sea to 5 km inland. The effect of the stability of the incident air mass on the vertical development of the boundary layer is evident. P.T.H.

A75-47129 **Development of four magnetic storms in February 1972.** L. J. Cahill, Jr. and Y. C. Lee (Minnesota, University, Minneapolis, Minn.). *Planetary and Space Science,* vol. 23, Sept. 1975, p. 1279-1292. 27 refs.

The development of four magnetic storms observed by Explorer 45 in February 1972 is described. The storms were observed in the evening quadrant of the inner magnetosphere and ranged in magnitude from small to moderate. It is noted that three of the storms had sudden commencements and that several substorms occurred during the development phases. Evidence is presented for a partial ring current above L = 5 at the beginning of the substorms and for the enhancement of a partial ring below L = 5 after the expansion phase of several substorms. Distortions of the geomagnetic field in the east-west direction which accompanied the substorm expansions are attributed to field-aligned currents flowing from the ionosphere. It is concluded that these observations support the concept of a partial ring current and an eastward electrojet in the evening quadrant. F.G.M.

A75-47140 **The roles of the north-south component of the interplanetary magnetic field on large-scale auroral dynamics observed by the DMSP satellite.** S.-I. Akasofu (Alaska, University, Fairbanks, Alaska). *Planetary and Space Science,* vol. 23, Oct. 1975, p. 1349-1354. 13 refs. NSF Grant No. GA-36873; Contract No. F19628-72-C-0301.

A75-47229 * **Geothermal hazards - Mercury emission.** S. M. Siegel and B. Z. Siegel (Hawaii, University, Honolulu, Hawaii). *Environmental Science and Technology,* vol. 9, May 1975, p. 473, 474. 18 refs. Research supported by the Cottrell Foundation, University of Hawaii, and NASA.

Enthusiasm for intensified geothermal exploration may induce many participants to overlook a long-term potential toxicity hazard possibly associated with the tapping of magmatic steam. The association of high atmospheric Hg levels with geothermal activity has been established both in Hawaii and Iceland, and it has been shown that mercury can be introduced into the atmosphere from fumaroles, hot springs, and magmatic sources. These arguments, extended to thallium, selenium, and other hazardous elements, underscore the need for environmental monitoring in conjunction with the delivery of magmatic steam to the surface. (Author)

A75-47412 * **Remote measurement of aerosol particle characteristics and their significance to meteorology.** J. G. Kuriyan (California, University, Los Angeles, Calif.). *Optical Engineering,* vol. 14, July-Aug. 1975, p. 332-338. 30 refs. Grant No. NsG-1106.

Theoretical models for the calculation of the radiative effects of atmospheric aerosols require the inference of such parameters as optical depth, the complex index of refraction and the equivalent size distribution. A polarimeter and a multispectral radiometer are used for local monitoring of aerosols via ground stations, or global monitoring via spacecraft occultation experiments. It is shown that measurements of optical depth at one wavelength as has been the custom, are insufficient to provide useful information for meteorological calculations, and new experiments and instruments must be devised to take advantage of new theoretical developments. B.J.

A75-47788 **Geomagnetic field and trapped particles in the noon sector of the magnetosphere.** A. E. Antonova and V. P. Shabanskii (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). *(Geomagnetizm i Aeronomiia,* vol. 14, Nov.-Dec. 1974, p. 1120-1122.) *Geomagnetism and Aeronomy,* vol. 14, no. 6, 1974, p. 944-946. 14 refs. Translation.

N75-28486*# Geological Survey, Reston, Va.
URBAN AND REGIONAL LAND USE ANALYSIS: CARETS AND CENSUS CITIES EXPERIMENT PACKAGE Monthly Progress Report
Robert Alexander, Principal Investigator, Harry F. Lins, Jr., and Daniel B. Gallagher 25 Feb. 1975 16 p EREP
(NASA Order T-5290-B)
(E75-10348; NASA-CR-143150) Avail: NTIS HC $3.25 CSCL 08B

The author has identified the following significant results. Temperatures in degrees Celsius were derived from PCM counts using the Pease's modified gray window technique. The Outcalt simulator was setup on the USGS computer. The input data to the model are basically meteorological and geographical in nature. The output data is presented in three matrices.

N75-28491*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
A STUDY OF ATMOSPHERIC EFFECTS ON PATTERN RECOGNITION DEVICES Final Report
Fred Thomson, Principal Investigator and F. G. Sadowski Jul. 1975 66 p refs Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21783)
(E75-10353; NASA-CR-143155; ERIM-193300-62-F) Avail: NTIS HC $4.25 CSCL 08B

The author has identified the following significant results. ERTS-1 imagery can be applied in the broadscale assessment of forest resources as a supplement to aerial photography and field survey. There was no application to inventory of crop and pasture diseases mainly because of poor quality and low resolution, and unreliability of image acquisition. Inventory of soil erosion was satisfactory in humid eastern New South Wales, but not in semi-arid areas. Patterns of snow cover, areas of water in natural and artificial water bodies, extent of bushfires, and location of coastal mobile sand bodies were readily apparent. ERTS-1 imagery was judged to be a valuable addition to conventional techniques

of regional small scale geological mapping. ERTS data was successfully used to map flooding and flood progression. The imagery was found suitable for mapping at 1:1,000,000 scale both on the mainland and in Antarctica, but did not meet accuracy specifications for 1:250,000 mapping.

N75-28494*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, Jun. 1975
Irvin J. Sattinger, Principal Investigator 14 Jul. 1975 2 p EREP
(Contract NAS9-13283)
(E75-10356; NASA-CR-143158; ERIM-103300-54-L) Avail: NTIS HC $3.25 CSCL 08B

N75-28495*# National Environmental Satellite Service, Washington, D.C.
A CLOUD PHYSICS INVESTIGATION UTILIZING SKYLAB DATA Quarterly Progress Report, Apr. - Jun. 1975
John Alishouse, Herbert Jacobowitz, and David Wark, Principal Investigators Jun. 1975 3 p EREP
(NASA Order T-4715-B)
(E75-10357; NASA-CR-143159; QPR-9) Avail: NTIS HC $3.25 CSCL 04A

The author has identified the following significant results. The Lowtran 2 program, S191 spectral response, and solar spectrum were used to compute the expected absorption by 2.0 micron band for a variety of cloud pressure levels and solar zenith angles. Analysis of the three long wavelength data channels continued in which it was found necessary to impose a minimum radiance criterion. It was also found necessary to modify the computer program to permit the computation of mean values and standard deviations for selected subsets of data on a given tape. A technique for computing the integrated absorption in the A band was devised. The technique normalizes the relative maximum at approximately .78 micron to the solar irradiance curve and then adjusts the relative maximum at approximately .74 micron to fit the solar curve.

N75-28496*# Boeing Co., Kent, Wash.
QUANTITATIVE DETERMINATION OF STRATOSPHERIC AEROSOL CHARACTERISTICS Monthly Report, Jun. 1975
David L. Tingey, Principal Investigator Jun. 1975 14 p EREP
(Contract NAS9-13303)
(E75-10358; NASA-CR-143160) Avail: NTIS HC $3.25 CSCL 04A

The author has identified the following significant results. The multiplicative scale factor needed to calibrate the recorded intensity is obtained by fitting the measured curve against a brightness model. The model was converted to the multispectral band scanner signal. Inversion of this measured signature is shown as the profile of attenuation coefficients versus altitude. Because of Gaussian noise, data were not measured directly. Data were fit with two exponential curves, one covering the lower altitude and the other covering the higher altitude. A twenty point curve was derived by selecting a data point and plotting its value from each of twenty adjacent scans. Noise from the lower altitudes was found to be erratic.

N75-28562*# Drexel Univ., Philadelphia, Pa. Dept. of Physics and Atmospheric Science.
OUR CONTAMINATED ATMOSPHERE: THE DANGER OF CLIMATE CHANGE, PHASES 1 AND 2 Final Report
Alan J. Cimorelli and Frederick B. House [1974] 76 p refs
(Contract NAS1-11871)
(NASA-CR-132625) Avail: NTIS HC $4.75 CSCL 13B

The effects of increased concentrations of atmospheric particulate matter on average surface temperature and on the components of the earth's radiation budget are studied. An atmospheric model which couples particulate loading to surface temperature and to changes in the earth's radiation budget was used. A determination of the feasibility of using satellites to monitor the effect of increased atmospheric particulate concentrations is performed. It was found that: (1) a change in man-made particulate loading of a factor of 4 is sufficient to initiate an ice age; (2) variations in the global and hemispheric weighted averages of surface temperature, reflected radiant fluz and emitted radiant flux are nonlinear functions of particulate loading; and (3) a black satellite sphere meets the requirement of night time measurement sensitivity, but not the required day time sensitivity. A nonblack, spherical radiometer whose external optical properties are sensitive to either the reflected radiant flux or the emitted radiant flux meets the observational sensitivity requirements.
Author

N75-28654# Naval Research Lab., Washington, D.C.
WATER VAPOR MEASUREMENTS OVER THE EASTERN PACIFIC OCEAN AT THE 180 MILLIBAR PRESSURE LEVEL Final Report
Henry J. Mastenbrook 22 Jan. 1975 12 p refs
(Contract DOT-AS-30065; NRL Proj. A03-09)
(AD-A005396; NRL-7849) Avail: NTIS CSCL 04/2

A frost-point hygrometer has been installed on the NASA C141 Flying Observatory to measure water vapor in the upper troposphere and lower stratosphere. Measurements were made during two flights in June 1974 in the region of the subtropical high-pressure cell over the eastern Pacific Ocean at an upper tropospheric pressure height of 180 mb. The relative humidity in the region was found to be high, implying that the subsidence characterizing the lower tropospheric level of the subtropical high is weak or nonexistent at the 180-mb level in early summer. Saturation of the level at times due to vertical oscillations seems likely.
GRA

N75-29510*# Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
SATELLITE DETECTION OF VEGETATIVE DAMAGE AND ALTERATION CAUSED BY POLLUTANTS EMITTED BY A ZINC SMELTER Interim Report
George J. McMurtry, Gary W. Petersen, Principal Investigators, E. L. Fritz, and S. P. Pennypacker Nov. 1974 16 p refs Presented at the 66th Ann. Meeting of the Phytopathological Soc. and the 40th Sess. of the Can. Phytopathological Soc., Vancouver, B. C., 11-15 Aug. 1974 ERTS
(Contract NAS5-23133)
(E75-10368; NASA-CR-143226; ORSER-SSEL-TR-19-74) Avail: NTIS HC $3.25 CSCL 13B

The author has identified the following significant results. Field observations and data collected by low flying aircraft were used to verify the accuracy of maps produced from the satellite data. Although areas of vegetation as small as six acres can accurately be detected, a white pine stand that was severely damaged by sulfur dioxide could not be differentiated from a healthy white pine stand because spectral differences were not large enough. When winter data were used to eliminate interference from herbaceous and deciduous vegetation, the damage was still undetectable. The analysis was able to produce a character map that accurately delineated areas of vegetative alteration due to high zinc levels accumulating in the soil. The map depicted a distinct gradient of less damage and alteration as the distance from the smelter increased. Although the satellite data will probably not be useful for detecting small acreages of damaged vegetation, it is concluded that the data may be very useful as an inventory tool to detect and delineate large vegetative areas possessing differing spectral signatures.

N75-29512*# Saint Lawrence Univ., Canton, N.Y. Dept. of Geology and Geography.
INVESTIGATION OF RELATIONSHIPS BETWEEN LINEARS, TONAL AND HAZY ANOMALIES, AND PETROLEUM PRODUCTION IN THE WILLISTON BASIN: AN ERTS APPROACH Semiannual Status Report, Nov. 1974 - Apr. 1975
J. Mark Erickson, James S. Street, Principal Investigators, Cynthia J. Munsell, and Douglas E. Brien Apr. 1975 7 p ERTS
(Grant NsG-5018)
(E75-10370; NASA-CR-143228) Avail: NTIS HC $3.25 CSCL 08B

N75-29516*# Federation of Rocky Mountain States, Inc., Denver, Colo.
A REGIONAL LAND USE SURVEY BASED ON REMOTE SENSING AND OTHER DATA Quarterly Report, 10 Apr. - 10 Jul. 1975
George Nez, Principal Investigator 10 Jul. 1975 24 p ERTS
(Contract NAS5-22338)
(E75-10374; NASA-CR-143233) Avail: NTIS HC $3.25 CSCL 08B

N75-29519*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
STUDY OF THE UTILIZATION OF EREP DATA FROM THE WABASH RIVER BASIN Monthly Report
LeRoy F. Silva, Principal Investigator Jun. 1975 2 p EREP
(Contract NAS9-13301)
(E75-10377; NASA-CR-143239) Avail: NTIS HC $3.25 CSCL 08H

N75-29523*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
OIL-POLLUTION DETECTION AND MONITORING FROM SPACE USING ERTS-1 Final Report, 12 Jun. 1972 - 30 Nov. 1974
Robert Horvath and Gary C. Goldman, Principal Investigators Jul. 1975 57 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21783)
(E75-10381; NASA-CR-143243; ERIM-193300-68-F) Avail: NTIS HC $4.25 CSCL 13B

The author has identified the following significant results. Three reported spills were investigated using four digital computer, compatible techniques on ERTS - 1 data. A spill on the Atlantic Ocean (off Virginia) was studied to develop spectral signatures. Another spill, in Oakland Bay, was studied by ratioing spectral channels (to try to eliminate turbidity effects) and by summing different spectral channels to look for anomolus values caused by oil. The final spill, off Southern California, was investigated by looking for anomolus values in each channel separately. Results indicate that any of these methods might be usable if the spill is large enough to be seen by satellite, if the spill occurs more than a few kilometers off shore, and if the sky and water are relatively clear. In the case of the Atlantic spill, identification of material was not possible; and in the other two cases, the spills could not be detected at all. ERTS-1 was not considered feasible for this type of work because of its 18 day overpass frequency, the few spectral channels, the extended bandwidths, and the long, information retrieval time.

N75-29525*# Alaska Univ., Fairbanks. Inst. of Arctic Biology.
LAND USE MAPS OF THE TANANA AND PURCELL MOUNTAIN AREAS, ALASKA, BASED ON EARTH RESOURCES TECHNOLOGY SATELLITE IMAGERY Interim Report, Sep. - Dec. 1974
J. H. Anderson, Principal Investigator 13 Dec. 1974 20 p refs ERTS
(Contract NAS5-21833)
(E75-10383; NASA-CR-143245) Avail: NTIS HC $3.25 CSCL 08B

The author has identified the following significant results. ERTS imagery in photographic format was used to make land use maps of two areas of special interest to native corporations under terms of the Alaska Native Claims Settlement Act. Land selections are to be made in these areas, and the maps should facilitate decisions because of their comprehensive presentation of resource distribution information. The ERTS images enabled mapping broadly-defined land use classes in large areas in a comparatively short time. Some aerial photography was used to identify colors and shades of gray on the various images. The 14 mapped land use categories are identified according to the classification system under development by the U.S. Geological Survey. These maps exemplify a series of about a dozen diverse Alaskan areas. The principal resource depicted is vegetation, and clearly shown are vegetation units of special importance, including stands possibly containing trees of commercial grade and stands constituting wildlife habitat.

N75-29531*# Martin Marietta Corp., Baltimore, Md.
GROUND TRUTH DATA FOR TEST SITES (SL-3)
29 Mar. 1974 142 p
(Contract NAS8-24000)
(NASA-CR-141911; MSC-05537) Avail: NTIS HC $5.75 CSCL 05B

Field measurements performed simultaneously with Skylab overpasses in order to provide comparative calibration and performance evaluation measurements for the EREP sensors are presented. The solar radiation region from 400 to 1300 nanometers and the thermal radiation region from 8 to 14 micrometer region were investigated. The measurements of direct solar radiation were analyzed for atmospheric optical depth; the total and reflected solar radiation were analyzed for target reflectivity. These analyses were used in conjunction with a radiative transfer computer program in order to calculate the amount and spectral distribution of solar radiation at the apertures of the EREP sensors. The instrumentation and techniques employed, calibrations and analyses performed, and results obtained are discussed. Author

N75-29532*# Martin Marietta Corp., Baltimore, Md.
GROUND TRUTH DATA FOR TEST SITES (SL-4)
30 Apr. 1974 81 p refs
(Contract NAS8-24000)
(NASA-CR-141912; MSC-05543) Avail: NTIS HC $4.75 CSCL 05B

Field measurements performed simultaneous with Skylab overpass in order to provide comparative calibration and performance evaluation measurements for the EREP sensors are presented. Wavelength region covered include: solar radiation (400 to 1300 nanometer), and thermal radiation (8 to 14 micrometer). Measurements consisted of general conditions and near surface meteorology, atmospheric temperature and humidity vs altitude, the thermal brightness temperature, total and diffuse solar radiation, direct solar radiation (subsequently analyzed for optical depth/transmittance), and target reflectivity/radiance. The particular instruments used are discussed along with analyses performed. Detailed instrument operation, calibrations, techniques, and errors are given. Author

N75-29533*# Joint Publications Research Service, Arlington, Va.
INFORMATION CONTENT OF THE DATA OBTAINED BY REMOTE SENSING OF THE PARAMETERS OF THE ENVIRONMENT AND THE EARTH'S RESOURCES FROM SPACE
K. Ya. Kondratyev, A. A. Grigoryev, and O. M. Pokrovskiy Washington NASA Aug. 1975 103 p refs Transl. into ENGLISH of the book "Informatsionnoye Soderzhaniye Dannykh Kosmicheskoy Distantsionnoy Indikatsii Parametrov Okruzhayushchey Sredy i Prirodnykh Resursov" Leningrad, Leningrad Univ. Press, 1975 p 1-146
(NASA-TT-F-16435) Avail: NTIS HC $5.25 CSCL 05B

The theory of information content of an experiment and the application of this theory to the problems of remote atmospheric sounding and the optimum choice of spectral intervals for multispectral surveying, are discussed. The main requirements for basic information on the earth's radiation field are listed (the areas of the spectrum providing the most information, the necessary spectral and spatial resolution, the required frequency of data production, and so forth) that are used to solve various problems in such areas as hydrology, oceanology, forestry and agriculture, and geology. Author

N75-29670 GATE Operational Control Centre, Dakar (Senegal).
AIRCRAFT MEASUREMENTS OF REFLECTED SOLAR RADIATION ANGULAR AND SPECTRAL CHARACTERISTICS IN GATE PROGRAM. PART 1: REFLECTION INDICATRIX
V. I. Korzov (Main Geophys. Obs., Leningrad) and N. E. Ter-Markaryants (Main Geophys. Obs., Leningrad) *In* WMO Prelim. Sci. Results of the GARP Atlantic Trop. Expt., Vol. 2 Jan. 1975 p 278-283 refs

Within the GATE program, the measurements of the angular reflected solar radiation distribution were taken in 10 bands of the 0.5-1.5 micrometers spectral region from the IL-18 MGO aircraft by means of a two channel scanning radiometer. From the observational data, the relative angular distribution of the reflected radiation and the relative spectral brightness were determined. Over the ocean, under cloudless conditions, the angular characteristics of reflection were measured at various aerosol contents in the atmosphere. From the data obtained, reflection models were constructed in different azimuth directions for various flight altitudes, wavelengths, and sun's altitude. ESRO

N75-30620*# Texas Univ., Austin.
STREAM NETWORK ANALYSIS AND GEOMORPHIC FLOOD PLAIN MAPPING FROM ORBITAL AND SUBORBITAL REMOTE SENSING IMAGERY APPLICATION TO FLOOD HAZARD STUDIES IN CENTRAL TEXAS Final Report
Victor R. Baker, Principal Investigator, Robert K. Holz, Steven D. Hulke, Peter C. Patton, and Margarida M. Penteado 30 Apr. 1975 187 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13312)
(E75-10387; NASA-CR-144354) Avail: NTIS HC $7.00 CSCL 08H

The author has identified the following significant results. Development of a quantitative hydrogeomorphic approach to flood hazard evaluation was hindered by (1) problems of resolution and definition of the morphometric parameters which have hydrologic significance, and (2) mechanical difficulites in creating the necessary volume of data for meaningful analysis. Measures of network resolution such as drainage density and basin Shreve magnitude indicated that large scale topographic maps offered greater resolution than small scale suborbital imagery and orbital imagery. The disparity in network resolution capabilities between orbital and suborbital imagery formats depends on factors such as rock type, vegetation, and land use. The problem of morphometric data analysis was approached by developing a computer-assisted method for network analysis. The system allows rapid identification of network properties which can then be related to measures of flood response.

N75-30624*# Pennsylvania State Univ., University Park.
COMPARISON OF SKYLAB AND LANDSAT LINEAMENTS WITH JOINT ORIENTATIONS IN NORTHCENTRAL PENNSYLVANIA Interim Report
George J. McMurtry, Gary W. Petersen, Principal Investigators, and W. S. Kowalik Jul. 1975 13 p refs ERTS
(Contracts NAS5-23133; NAS9-13406)
(E75-10391; NASA-CR-143297) Avail: NTIS HC $3.25 CSCL 08G

The author has identified the following significant results. The histogram peaks of lineaments mapped from Skylab photograph at a scale of 1:517,000 lie subparallel, within 20 deg, to major shale joints and coal cleats on part of the Allegheny Plateau. The Landsat lineament, mapped at 1:989,000 are biased by illumination and scan line directions. While there is an illumination bias in the Skylab photograph, its direction does not coincide with the main transverse lineament trend, thus providing an independent assessment of the illumination direction bias. The coincidence in direction regardless of scale of the linear features suggests a mechanical relationship between joints, fracture traces, and lineaments which is more consistent with a tensional model than a shear model of origin.

N75-30625*# Pennsylvania State Univ., University Park.
APPLICATIONS OF CLUSTER ANALYSIS IN NATURAL RESOURCES RESEARCH Interim Report
George J. McMurtry, Gary W. Petersen, Principal Investigators, and B. J. Turner Jul. 1975 8 p refs Repr. from Forest Sci., v. 20, no. 4, Dec. 1974 p 343-349 Sponsored in part by Dept. of Environ. Resources ERTs
(Contract NAS5-23133)
(E75-10392; NASA-CR-143298; ORSER-SSEL-TR-6-75) Avail: NTIS HC $3.25 CSCL 05B

N75-30626*# Pennsylvania State Univ., University Park.
RELATION OF LINEAMENTS TO SULFIDE DEPOSITS: BALD EAGLE MOUNTAIN, CENTRE COUNTY, PENNSYLVANIA Interim Report
George J. McMurtry, Gary W. Petersen, Principal Investigators, M. D. Krohn, and D. P. Gold Jul. 1975 9 p refs Original contains imagery. Orginal photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-23133)
(E75-10393; NASA-CR-143299; ORSER-SSEL-TR-9-75) Avail: NTIS HC $3.25 CSCL 08G

The author has identified the following significant results. Discrete areas of finely-fractured and brecciated sandstone float are present along the crest of Bald Mountain and are commonly sites of sulfide mineralization, as evidenced by the presence of barite and limonite gossans. The frequency distributions of the brecciated float as the negative binomial distribution supports the interpretation of a separate population of intensely fractured material. Such zones of concentrated breccia float have an average width of one kilometer with a range from 0.4 to 1.6 kilometers and were observed in a quarry face to have subvertical dips. Direct spatial correlation of the Landsat-derived lineaments to the fractured areas on the ridge is low; however, the mineralized and fracture zones are commonly assymetrical to the lineament positions. Such a systematic dislocation might result from an inherent bias in the float population or could be the product of the relative erosional resistance of the silicified material in the mineralized areas in relation to the ersionally weak material at the stream gaps.

N75-30627*# Iowa Geological Survey Remote Sensing Lab.
LAND CLASSIFICATION OF SOUTH-CENTRAL IOWA FROM COMPUTER ENHANCED IMAGES Progress Report, 3 May - 3 Aug. 1975
James V. Taranik, James R. Lucas, Principal Investigators, and Frederic C. Billingsley (JPL) 3 Aug. 1975 18 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-20832)
(E75-10394; NASA-CR-143300; Rept-2) Avail: NTIS HC $3.25 CSCL 08F

The author has identified the following significant results. Two CCT (computer compatible tapes) scenes were digitally enhanced). The IMAGE 100 system was utilized for image processing The real time ability of this machine allowed large scale viewing of several selected areas on both CCT's.

N75-30644# National Bureau of Standards, Boulder, Colo.
ELECTROMAGNETIC ATTENUATION PROPERTIES OF CLAY AND GRAVEL SOILS
Doyle A. Ellerbruch Aug. 1974 25 p refs Sponsored in part by AFWL
(COM-75-10522/1; NBSIR-74-381) Avail: NTIS HC $3.25 CSCL 13B

The feasibility of using active microwave techniques to differentiate between the different subsurface layers in a pavement system was examined. The electromagnetic attenuation properties of clay and gravel soils were measured as a function of moisture content and frequency. Measurements were done at frequencies in the 0.5 - 4.5 GHz range. Soil samples were compounded in

the laboratory at approximately 10, 50 and 90% saturation. Sample thickness was in the range 2.5 - 20.3 cm. Each homogeneous sample was sealed in a polyethylene container to retain the total moisture and to maintain a constant moisture content with depth. GRA

N75-30686# National Academy of Sciences - National Research Council, Washington, D.C.
PLANNING FOR ENVIRONMENTAL INDICES Final Report
Feb. 1975 57 p refs Sponsored in part by Dept. of Commerce, Geological Survey, and EPA
(Contract EQC-326)
(PB-240971/2; EQC-326275) Avail: NTIS HC $4.25 CSCL 05A

This study examines the important multidisciplinary considerations related to environmental indices and makes recommendations regarding their development. The report includes examples of indices and a short bibliography. GRA

N75-30751# Chicago Univ., Ill. Satellite and Mesometeorology Research Project.
A KINETIC ANALYSIS OF TROPICAL STORM BASED ON ATS CLOUD MOTIONS
T. Theodore Fujita and Jaime J. Tecson Aug. 1974 26 p refs
(Grant NOAA-04-3-022-8)
(COM-75-10581/7; SMRP-RP-125; NOAA-75041411) Avail: NTIS HC $3.25 CSCL 04B

The asymmetric structure of an incipient storm in the Atlantic Ocean was determined, using low-cloud velocities computed from the applications technology satellite (ATS 111) picture sequences. The investigation concerns the kinematic analysis of tropical storm Anna during July 26, 27, and 28, 1969 when it intensified into tropical storm stage in the vicinity of 10 degrees N and 35 degrees W, reportedly late on the 27th. The cross-equatorial flow from the Southern Hemisphere was responsible for providing the inflow to the storm while the Northern Hemisphere trade supplied the major contribution to the circulation around the storms. The inflow from the southern sector of the disturbance and the over-all circulation increased as the storm intensified. GRA

N75-31192# Academy of Sciences (USSR), Moscow. Inst. for Space Research.
INFLUENCE OF SHORT-PERIODIC VARIATIONS OF THE ATMOSPHERIC DENSITY ON AN ACCURACY OF CLOSE AES ORBIT CALCULATIONS
P. E. Elyasberg, B. V. Kugaenko, and M. I. Voiskovsky 1974 33 p refs
(D-187) Avail: NTIS HC $3.75

The effects of short periodic variations of atmospheric density on the accuracy of calculations of AES orbits with low perigees are considered. It was assumed that the effects of long periodic variations of density is taken into account by using the atmospheric model. The influence of the following types of density cariations were estimated: variations correlating with a geomagnetic disturbance, random variations proportional to a solar radio radiation intensity, and random variations of density not described by the chosen density model. Statistical characteristics for the first two types of variations can be obtained by using the appropriate processing of the index values. The characteristics for the third type are defined as a function of the analysis of residuals appearing after refinement of the coefficients for the density model. Calculations errors for the interval of an orbit prediction and for the interval of the agreement of the AES average dragging, based on the results of two adjacent determinations of an orbit, are analyzed. Author (ESRO)

N75-31553*# Arizona Univ., Tucson. Office of Arid Lands Studies.
APPLIED REMOTE SENSING PROGRAM (ARSP) TO STATE AND LOCAL GOVERNMENT Annual Report
Jack D. Johnson, Kennith E. Foster, David A. Mouat, and Robin Clark Aug. 1975 66 p refs
(Grant NGL-03-002-313)
(NASA-CR-143456; OALS-Bull-10) Avail: NTIS HC$4.25 CSCL 08B

Environmental surveys of arid land areas (Arizona) in the United States are presented. Maps of soils, vegetation, drainage patterns, and land use are shown. The distribution of uranium deposits, oil and gas pools, is also shown. Legislation pertaining to the preservation of natural resources is discussed. J.R.T.

N75-32446# Lincoln Lab., Mass. Inst. of Tech., Lexington.
OPTICS RESEARCH: 1974:2 Semiannual Report, 1 Jul. - 31 Dec. 1974
Robert H. Rediker 31 Dec. 1974 49 p refs
(Contract F19628-73-C-0002; ARPA Order 600)
(AD-A010476; ESD-TR-75-107) Avail: NTIS CSCL 20/5

Research in laser technology, thermal blooming of successive laser pulses, and optical instruments is reviewed. Other topics discussed include multiple-pulse blooming of focused beam in a uniform wind, laboratory experiment on thermal blooming, impulsive loading of targets by high frequency laser pulses, double-pulse pressure and impulse measurements, ballistic pendulum for high-lower laser measurements, laser heating of metallic surfaces, plasma enhancement of thermal coupling to targets, stable CO2 laser measurements, pollution studies, the St. Louis regional air pollution study, and diode laser multi-pollutant ambient-air monitoring. Author

N75-32624# Smithsonian Institution, Cambridge, Mass. Center for Short-lived Phenomena.
DIRECTORY OF EPA, STATE AND LOCAL ENVIRONMENTAL QUALITY MONITORING AND ASSESSMENT ACTIVITIES Final Report
John W. Scotton, Kevin T. Mullen, John Whitman, and Robert Citron Dec. 1974 385 p
(Contract EPA-68-01-2442)
(PB-241757/4; EPA-600/4-75-001) Avail: NTIS HC $10.25; HC also available from SOD CSCL 13B

The directory describes state and local environmental quality monitoring programs of the United States. It also includes the Environmental Protection Agency's (EPA) national programs and systems which collect, analyze and evaluate these data. It will be useful as a reference and a guide to more detailed information. GRA

N75-33213# Naval Ship Research and Development Center, Bethesda, Md.
DETERMINING THE CONCENTRATION OF OIL IN WATER SAMPLES BY INFRARED SPECTROPHOTOMETRY. PHASE 1: SAMPLE AGING STUDY
Stanley Finger, Harry Feingold, Ed. Timko, and Sidney Orbach (Bradford Computer and Systems, Inc.) Dec. 1974 113 p refs
(Contract N00600-72-D-0613)
(AD-A011040; NSRDC-4535) Avail: NTIS CSCL 07/3

Oil in water samples of Naval Distillate Fuel Oil (NDFO) and Steam Turbine Lubricating Oil (MS 2190 TEP) at concentrations of 16 p/m and 100 p/m were studied to determine and quantify aging due to various types of degradation with time, under normal storage conditions. The samples were prepared individually from synthetic sea water and a quantity of oil which gave the desired concentration. The samples were analyzed at several intervals during an eight-week aging period. Oil concentration was determined by a method which is based on carbon tetrachloride solvent extraction and the infrared spectrophotometric measurements of the extract. Calibration curves relating the absorbance with oil concentration for the two oils were prepared from a measured quantity of oil in carbon tetrachloride. The purpose of the sample aging study was to obtain information for use in scheduling sample shipment and analysis in a forthcoming inter-laboratory study of the oil concentration measurement technique, as well as to estimate the allowable delay in sample analysis after field sampling. GRA

N75-33456*# Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
LAND USE MAPPING IN ERIE COUNTY, PENNSYLVANIA: A PILOT STUDY Interim Report

George J. McMurtry, Gary W. Petersen, Principal Investigators, and G. A. May Dec. 1974 4 p refs ERTS
(Contract NAS5-23133)
(E75-10401; NASA-CR-143394; ORSER-SSEL-TR-24-74) Avail: NTIS HC $3.25 CSCL 08B

The author has identified the following significant results. A pilot study was conducted to determine the feasibility of mapping land use in the Great Lakes Basin area utilizing ERTS-1 data. Small streams were clearly defined by the presence of trees along their length in predominantly agricultural country. Field patterns were easily differentiated from forested areas; dairy and beef farms were differentiated from other farmlands, but no attempt was made to identify crops. Large railroad lines and major highway systems were identified. The city of Erie and several smaller towns were identified, as well as residential areas between these towns, and docks along the shoreline in Erie. Marshes, forests, and beaches within Presque Isle State Park were correctly identified, using the DCLUS program. Bay water was differentiated from lake water, with a small amount of misclassification.

N75-33471*# Oregon State Univ., Corvallis.
THE COMPARATIVE EVALUATION OF ERTS-1 IMAGERY FOR RESOURCE INVENTORY IN LAND USE PLANNING Final Report, Jul. 1972 - Jan. 1974
Barry J. Schrumpf, Principal Investigator, G. H. Simonson, D. P. Paine, R. D. Lawrence, W. T. Pyott, J. H. Herzog, R. J. Murray, J. A. Norgren, J. A. Cornwell, and R. A. Rogers Oct. 1974 322 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21831)
(E75-10416; NASA-CR-143406) Avail: NTIS HC $9.25 CSCL 08B

The author has identified the following significant results. Multidiscipline team interpretation and mapping of resources for Crook County is complete on 1:250,000 scale enlargements of ERTS imagery and 1:120,000 hi-flight photography. Maps of geology, soils, vegetation-land use and land resources units were interpreted to show limitations, suitabilities, and geologic hazards for land use planning. Mapping of lineaments and structures from ERTS imagery has shown a number of features not previously mapped in Oregon. A multistage timber inventory of Ochoco National Forest was made, using ERTS images as the first stage. Inventory of forest clear-cutting practices was successfully demonstrated with color composites. Soil tonal differences in fallow fields correspond with major soil boundaries in loess-mantled terrain. A digital classification system used for discriminating natural vegetation and geologic material classes was successful in separating most major classes around Newberry Caldera, Mt. Washington, and Big Summit Prairie.

N75-33473*# General Electric Co., Philadelphia, Pa. Space Div.
APPLICATION OF EARTH RESOURCES TECHNOLOGY SATELLITE DATA TO URBAN AND REGIONAL PLANNING: TEST SITE, COUNTY OF LOS ANGELES Final Report, 30 Jun. 1972 - 30 Jun. 1974
S. Raje, J. McKnight, G. Willoughby, and R. Economy, Principal Investigators 2 Dec. 1974 174 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21797)
(E75-10418; NASA-CR-143408; Doc-74SD4265) Avail: NTIS HC $6.25 CSCL 08B

The author has identified the following significant results. The County of Los Angeles photointerpreted ERTS film products to define problems of interest, coordinated ground truth over the complex test site including interfaces with secondary users as well as participated in on-line analyses of the GE multispectral information extraction systems. Interactive machine analyses were carried out, developing techniques and procedures as well as evaluating the outputs for community and regional planning. Extensive aircraft underflight coverage was provided that was valuable both in inputs preparation and outputs evaluation of the machine-aided analyses. One of the nonstandard ERTS images led to the discovery of a major new fault lineament on the northern slope of the Santa Monica Mountains.

N75-33529# Coordinating Research Council, Inc., New York. Air Pollution Research Advisory Committee.
COOPERATIVE EVALUATION OF TECHNIQUES FOR MEASURING NITRIC OXIDE AND CARBON MONOXIDE IN DIESEL EXHAUST. PHASE 4 TEST REPORTS
Joseph Perez Jan. 1975 66 p refs
(PB-241710/3; CRC-472; CRC-APRAC-CAPI-1-65-8) Avail: NTIS HC $4.25 CSCL 14B

The measurements used to analyze diesel exhaust gas constituents are evaluated. A multi-cylinder engine was circulated to fifteen participants who measured emissions at three engine conditions. All fifteen participants measured nitric oxide and carbon monoxide with several laboratories measuring nitric oxide by both nondispersive infrared spectroscopy and chemiluminescence. Some participants also measured carbon dioxide, nitrogen oxide, and oxygen and unknown span gases. These test results were compared with cooperative tests which involved simultaneous measurement of emissions by participants. GRA

N75-33538# GEOMET, Inc., Rockville, Md.
IMPROVEMENT OF INSTRUMENTATION AND METHODOLOGY FOR COLLECTION AND ANALYSIS OF MERCURY Final Report, Apr. - Sep. 1974
D. J. Sibbett, R. H. Moyer, and T. R. Quinn Jan. 1975 84 p refs
(Contract EPA-68-02-1282)
(PB-242295/4; GEOMET-LF-434; EPA-650/2-75-028) Avail: NTIS HC $4.75 CSCL 07D

A collection device for the sampling of atmospheric mercury in its three forms, was miniaturized and streamlined and methods for the recovery and analysis of the collected mercury were simplified. The device consists of a two-section canister assembly which fits inside a standard Hi-Vol sampler underneath the support screen for the particulate filter. While particulate mercury is collected in the usual manner on glass fiber filter, mercury vapors are trapped on specific absorbants. Procedures were developed and tested for the recovery and analysis of elemental mercury, dimethyl mercury, and mercury-bearing particulates. These methods use standard laboratory instrumentation including an induction combustion furnace and an atomic absorption spectrophotometer. GRA

N75-33589# Committee on Agriculture and Forestry (U. S. Senate).
WEATHER MODIFICATION GRANTS.
Washington GPO 1974 142 p refs Hearing on S. 3313 before Subcomm. on Agr. Res. and Gen. Legislation of Comm. on Agr. and Forestry, 93d Congr., 2d Sess., Lawton, Okla., 19 Aug. 1974
(GPO-41-959) Avail: Subcomm. on Agr. Res. and Gen. Legislation

Testimony is provided on progress made and experiments conducted in the area of weather modification in terms of drought prevention. Topics discussed include: climate and agriculture economy, cloud seeding, long range predictions of precipitation, and the effect of solar variations on weather. The effectiveness of weather modification programs in Texas, Oklahoma, New Mexico, and South Dakota is examined. It is proposed to formulate and carry out an emergency weather modification program in any State in which livestock or crops are threatened because of drought conditions. J.M.S.

N75-33600 World Meteorological Organization, Geneva (Switzerland).
PLANS FOR STORMFURY EXPERIMENTS, 1977 - 1978
Eugene Bollay *In its* Typhoon Modification 1975 p 91-99

The cloud seeding experiments already carried out under Project Stormfury are listed and seeding eligibility rules are given. The experimental design of the project is discussed and the goal for Project Stormfury in the Pacific is outlined. Experiments are discussed in detail. ESA

N75-33609# *World Meteorological Organization, Geneva* (Switzerland).
[WORLD WEATHER WATCH, RESEARCH ACTIVITIES, AND TECHNICAL PROGRAMS] Annual Report, 1974
1975 206 p
(WMO-412; ISBN-92-63-20412-8) Avail: NTIS HC $7.25

A brief general review of the activities of WMO and its constituent bodies was given, followed by detailed progress reports on the four main program areas: world weather watch, research program, program on the interaction of man and his environment, and technical cooperation program. Summaries on meteorological education and training, technical and support activities and external stations, and legal and administrative matters are also given.
Author (ESA)

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03
GEODESY AND CARTOGRAPHY

Includes mapping and topography.

A75-38895 * **Spectral mapping of soil organic matter.** S. J. Kristof, M. F. Baumgardner (Purdue University, Lafayette, Ind.), and C. J. Johannsen (Missouri, University, Columbia, Mo.). *ITC Journal*, no. 4, 1974, p. 479-489. 11 refs. Grant No. NGL-15-005-112.

Multispectral remote sensing data were examined for use in the mapping of soil organic matter content. Computer-implemented pattern recognition techniques were used to analyze data collected in May 1969 and May 1970 by an airborne multispectral scanner over a 40-km flightline. Two fields within the flightline were selected for intensive study. Approximately 400 surface soil samples from these fields were obtained for organic matter analysis. The analytical data were used as training sets for computer-implemented analysis of the spectral data. It was found that within the geographical limitations included in this study, multispectral data and automatic data processing techniques could be used very effectively to delineate and map surface soils areas containing different levels of soil organic matter. (Author)

A75-41365 # **Coordinate system of an astronomical geodetic grid (O koordinatnoi sisteme astronomo-geodezicheskoi seti).** M. I. Iurkina. *Geodeziia i Kartografiia*, June 1975, p. 6-10. 6 refs. In Russian.

For the preparation of astronomical geodetic grids, it is recommended that a geodetic coordinate system be established which gives the coordinates of one point (its astronomical latitude and longitude at a given moment in time) and the astronomical longitude of a second point on the parallel of the first at the same moment in time. It is shown that the choice of such a coordinate system allows measurement results to be related to a single moment in time and eliminates the influence of variations in the earth's gravitational field. F.G.M.

A75-42667 # **Automatic cartography of ERTS remote-sensing data.** D. J. David, J. Deries, and F. Verger (Ecole Normale Supérieure des Jeunes Filles, Montrouge, Hauts-de-Seine, France). *(British Interplanetary Society, Symposium on European Participation in Earth Resources /Space/ Projects, University College of Science and Technology, London, England, Apr. 9, 1975.) British Interplanetary Society, Journal*, vol. 28, Sept.-Oct. 1975, p. 624-628. Research supported by the Centre National de la Recherche Scientifique.

The amount of available remote-sensing data, especially from satellites, is considerable, and treatment of such numerous data needs the use of electronic data processing techniques. We describe here an application of these techniques to the automatic cartography of ERTS data and review the advantages of the process. (Author)

A75-45259 **Classification of freshwater ice using multispectral radar images.** M. L. Bryan and R. Larson (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: International Radar Conference, Arlington, Va., April 21-23, 1975, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 511-515.

A four-channel multispectral radar was used to obtain data on freshwater ice. The study reported in this paper consists of radar data collection, (visual) analysis of these data and the continuing development of the proper ground truth techniques to be used in conjunction with such remotely sensed data. The in situ measurement of the electrical properties together with the determination of the physical properties of the ice (thickness, bottom and top roughness, stratification) appear to warrant further consideration. The documentation of radar energy penetration through the lake ice and its subsequent reflection from the bottom (ice-water) interface is considered to be one of the major contributions of this paper. The on a reduced-dimension site and a generalization of this stage onto the entire test zone. S.J.M.

A75-46349 **Surface circulation patterns off the east coast of Greenland as deduced from satellite photographs of ice floes.** P. E. LaViolette and J. M. Hubertz (U.S. Naval Oceanographic Office, Washington, D.C.). *Geophysical Research Letters*, vol. 2, Sept. 1975, p. 400-402.

N75-28476 British Library Lending Div., Boston Spa (England).
BREATHING OF EARTH'S CRUST
[1974] 3 p Transl. into ENGLISH from Moskovskaya Pravda (USSR), 23 Apr. 1974 p 5
(BLL-M-23505-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

A map is discussed which describes movements of the earth's crust in Eastern Europe. Vertical movements of the crust and geodetic observations are also discussed. M.J.S.

N75-28478 Illinois Univ., Urbana.
SIMULTANEOUS ADJUSTMENT OF PHOTOGRAMMETRIC AND GEODETIC OBSERVATIONS Ph.D. Thesis
Gerald Mason Elphingstone 1975 164 p
Avail: Univ. Microfilms Order No. 75-14106

A general mathematical model was developed for analytical aerotriangulation, which can perform the simultaneous adjustment of photogrammetric and geodetic observations. The types of geodetic observations included in the mathematical solution are distances, geodetic azimuths, astronomical azimuths, horizontal angles, longitudes, latitudes, elevations and elevation differences. The solution can accept any configuration of geodetic surveys; such as traverse, triangulation, trilateration, leveling, as well as independent distances, azimuths, angles, and elevation differences. The types of photogrammetric observations include image coordinates, exterior orientation parameters, ground control points, and altimeter measurements. Primary emphasis on the analysis of the tests was placed on the effect of the geodetic observations on the photogrammetric mathematical model. This effect was analyzed for large and small photogrammetric blocks to determine the advantages and disadvantages of the combined solution.
Dissert. Abstr.

N75-28502*# Lockheed Electronics Co., Houston, Tex. Life Sciences Applications Dept.
INDEX MAPS FOR GEMINI EARTH PHOTOGRAPHY
L. E. Giddings Apr. 1975 97 p refs
(Contract NAS9-12200)
(NASA-CR-141934; LEC-4101; JSC-09581) Avail: NTIS HC $4.75 CSCL 08B

Index maps for the Gemini missions are presented; these are for the Gemini 3 through Gemini 12 missions. The maps are divided into four sections: the whole earth; the Western Hemisphere and eastern Pacific Ocean; Africa, India, and the Near East; and Asia, Australia, and the Pacific Ocean. M.J.S.

N75-28608# Army Foreign Science and Technology Center, Charlottesville, Va.
EXPERIENCE GAINED AT GEODETIC OPERATIONS IN NORTHERN REGIONS
I. G. Barzenkov and B. V. Eliseev Feb. 1974 6 p ref Transl. into ENGLISH from Geod. Kartografiya (USSR), no. 9, 1972 p 11-13
(AD-A004976; FSTC-HT-23-1601-73) Avail: NTIS CSCL 08/5

The carrying out of geodetic work in Northern regions is briefly discusses. The differences of working in these latitudes and measures taken to provide accurate, up-to-date information are described. Methods of supplying and equipping the expeditions are discussed. GRA

N75-29619# Ohio State Univ., Columbus. Dept. of Geodetic Science.
MEAN GRAVITY ANOMALY PREDICTION FROM TERRESTRIAL GRAVITY DATA AND SATELLITE ALTIMETER DATA
Glenn N. Smith Aug. 1974 152 p refs
(Contract F19628-72-C-0120; AF Proj. 8607)
(AD-A006363; DGS-214; SR-18; AFCRL-TR-74-0451) Avail: NTIS CSCL 08/5

This paper examines the application of the statistical prediction concept to the prediction of useful mean gravity anomalies from actual existing gravity data. The primary method of estimation is the least squares prediction procedure of Moritz. Mathematical derivation of the prediction equations and explanation of the notation system are given and prediction equations are applied to the prediction of mean gravity anomalies of 1 degrees and 5 degrees near equal-area blocks. GRA

N75-30622*# Pennsylvania State Univ., University Park.
LINEAMENT MAP OF PENNSYLVANIA Interim Report
George J. McMurtry, Gary W. Petersen, Principal Investigators, W. S. Kowalik, and D. P. Gold Jul. 1975 4 p ERTS
(Contract NAS5-23133)
(E75-10389; NASA-CR-143295; ORSER-SSEL-TR-5-75) Avail: NTIS HC $3.25 CSCL 08H

N75-30623*# Pennsylvania State Univ., University Park.
LINEAMENTS AND MINERAL OCCURRENCES IN PENNSYLVANIA Interim Report
George J. McMurtry, Gary W. Petersen, Principal Investigators, W. S. Kowalik, and D. P. Gold Jul. 1975 20 p refs ERTS
(Contracts NAS5-23133; NAS9-13406)
(E75-10390; NASA-CR-143296; ORSER-SSEL-TR-14-75) Avail: NTIS HC $3.25 CSCL 08G

The author has identified the following significant results. A conservative lineament map of Pennsylvania interpreted from ERTS-1 channel 7 (infrared) imagery and Skylab photography was compared with the distribution of known metallic mines and mineral occurrences. Of 383 known mineral occurrences, 116 show a geographical association to 1 km wide lineaments, another 24 lie at the intersection of two lineaments, and one lies at the intersection of three lineaments. The Perkiomen Creek lineament in the Triassic Basin is associated with 9 Cu-Fe occurrences. Six Pb-Zn occurrences are associated with the Tyrone-Mount Union lineament. Thirteen other lineaments are associated with 3, 4, or 5 mineral occurrences each.

N75-30638*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PROCEDURE FOR LOCATING 10 km UTM GRID ON ALABAMA COUNTY GENERAL HIGHWAY MAPS
Charles T. N. Paludan 7 Aug. 1975 22 p refs
(NASA-TM-X-64953) Avail: NTIS HC $3.25 CSCL 08B

Each county highway map has a geographic grid of degrees and tens of minutes in both longitude and latitude in the margins and within the map as intersection crosses. These will be used to locate the universal transverse mercator (UTM) grid at 10 km intervals. Since the maps used may have stretched or shrunk in height and/or width, interpolation should be done between the 10 min intersections when possible. A table of UTM coordinates of 10 min intersections is required and included. In Alabama, all eastings are referred to a false easting of 500,000 m at 87 deg W longitude (central meridian, CM). Author

N75-31179*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
LIBRA: AN INEXPENSIVE GEODETIC NETWORK DENSIFICATION SYSTEM
Henry F. Fliegel, Marvin Gantsweg, and P. S. Callahan 15 Aug. 1975 98 p refs
(Contract NAS7-100)
(NASA-CR-143486; JPL-TM-33-725) Avail: NTIS HC $4.75 CSCL 14B

A description is given of the Libra (Locations Interposed by Ranging Aircraft) system, by which geodesy and earth strain measurements can be performed rapidly and inexpensively to several hundred auxiliary points with respect to a few fundamental control points established by any other technique, such as radio interferometry or satellite ranging. This low-cost means of extending the accuracy of space age geodesy to local surveys provides speed and spatial resolution useful, for example, for earthquake hazards estimation. Libra may be combined with an existing system, Aries (Astronomical Radio Interferometric Earth Surveying) to provide a balanced system adequate to meet the geophysical needs, and applicable to conventional surveying. The basic hardware design was outlined and specifications were defined. Then need for network densification was described. The following activities required to implement the proposed Libra system are also described: hardware development, data reduction, tropospheric calibrations, schedule of development and estimated costs. Y.J.A.

N75-31559# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
LOW-FREQUENCY MAGNETOTELLURIC SURVEY OF NEW ENGLAND Technical Report, 1974 - 1975
Paul William Kasameyer and Theodore R. Madden Sep. 1974 208 p refs
(Contract N00014-67-A-0204-0045; NR Proj. 371-401)
(AD-A009229) Avail: NTIS CSCL 08/7

Magnetotelluric data from an 11 station array in Vermont, New Hampshire and Massachusetts are presented. A statistical method is developed to estimate apparent resistivity tensor values when the magnetic fields are highly correlated. Observations of electric fields parellel to the structural trends N to NE result in apparent resistivity values comparable to those produced by assuming the Cantwell-McDonald conductivity distribution in the mantle, and different crustal conductivities at different locations. Upper mantle conductivities for the preferred models agree with measurements in other continental areas. Because heat flow is well known in New England, an upper limit may be put on the temperatures in the upper mantle, and the accuracy of using conductivity measurements on olivine as a thermometer for the mantle may be tested. The upper mantle is not warm enough to produce the observed conductivity with very pure olivine. GRA

N75-32578# Coast and Geodetic Survey, Washington, D.C.
PLANE COORDINATE INTERSECTION TABLES (2 1/2-MINUTE)-CALIFORNIA Special Publication
1975 287 p
(COM-75-10736/7; SP-327; NOAA-75050804) Avail: NTIS HC $8.75; also available from SOD CSCL 08E

The tables in this publication contain the plane coordinates for 2 1/2-minute intersections of meridians and parallels within the limits of the state of California. These plane coordinates, based on the state plane-coordinate system established by the U.S. Coast and Geodetic Survey, are arranged by 12 1/2-minute bands of latitude with the full range of longitude of the zone, followed by the coordinates for the next higher band of latitude. They are also arranged by zone. The purpose of these tables is for use in making maps. Meridians and parallels may be placed on maps constructed on a rectangular grid of the state system, or the grid lines of the system may be placed on maps constructed on a projection of meridians and parallels. Also, approximate values of plane coordinates of geographic positions may be obtained by interpolation within the tables. GRA

N75-33156*# Ohio State Univ. Research Foundation, Columbus. Dept. of Geodetic Science.
THE OSU 275 SYSTEM OF SATELLITE TRACKING STATION COORDINATES
Ivan I. Mueller and Muneendra Kumar Aug. 1975 33 p refs
(Grant NGR-36-008-093; OSURF Proj. 2514)
(NASA-CR-119099; Rept-228) Avail: NTIS HC $3.75 CSCL 17B

A brief review of the methods and data used in the OSU 275 geodetic system is given along with the summary of the results. Survey information regarding the tracking stations in the system is given in tabular form along with the geodetic and geophysical parameters, origin and orientation, Cartisian coordinates, and systematic differences with global and nonglobal geodetic systems. M.J.S.

N75-33464*# Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
LANDSAT APPLICATION OF REMOTE SENSING TO SHORELINE FROM ANALYSIS Quarterly Report
Robert Dolan, Principal Investigator and Jeffrey Heywood 15 Aug. 1975 20 p ERTS
(Contract NAS5-20999)
(E75-10409; NASA-CR-143402) Avail: NTIS HC $3.25 CSCL 08B

N75-33487# Technische Universitaet, Munich (West Germany). Inst. for Astronomical and Physical Geodesy.
COMPARISON OF METHODS FOR ESTABLISHING LARGE SCALE GEODETIC NETWORKS BY MEANS OF SATELLITE TECHNIQUES
H. Ludwig Nov. 1974 14 p refs Presented at the Un Inter-Regional seminar on Appl. of Geodetic and Remote Sensing Data from Satellites for Cartography (Surveying and Mapping), Sao Jose dos Campos, Brazil, 4-15 Nov. 1974 Sponsored by Deut. Forschungsgemeinschaft
(Contrib-118) Avail: NTIS HC $3.25

Different methods for the determination of station coordinates from satellite observations were compared in regard to their accuracy and applicability to the establishment of geodetic networks. The results are clearly in favor of Doppler observations with a satellite service system like those provided by the Navy Navigation Satellite System (NNSS). Author (ESA)

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04
GEOLOGY AND MINERAL RESOURCES

Includes mineral deposits, petroleum deposits, spectral properties of rocks, geological exploration, and lithology.

A75-38890 **The use of ERTS-1 multispectral imagery for geological mapping.** H. E. C. Van Der Meer Mohr (International Institute for Aerial Survey and Earth Sciences, Enschede, Netherlands), A. M. Rakshit (Geological Survey of India, Jaipur, India), V. D. Bhate (Geological Survey of India, Nagpur, India), and R. P. Sharma (Indian Photointerpretation Institute, Dehra Dun, India). *ITC Journal*, no. 3, 1974, p. 385-394.

ERTS-1 multispectral imagery of the Montalban area in Spain was analyzed by means of standard photo interpretation methods. The study was undertaken to evaluate the usefulness of the system for geological mapping. The interpretation results were compared with existing geological maps and with the results obtained from conventional aerial photographs. The relative merits and disadvantages of the system are discussed. (Author)

A75-39360 * **Reconnaissance geology of the Amaro hörst, southern Ethiopian rift.** D. Levitte (Geological Survey of Israel, Jerusalem, Israel), J. Columba (Geological Survey of Ethiopia, Addis Ababa, Ethiopia), and P. Mohr (Smithsonian Astrophysical Observatory, Cambridge, Mass.). *Geological Society of America Bulletin*, vol. 85, Mar. 1974, p. 417-422. 25 refs. Grant No. NGR-09-015-002.

A75-39540 * **Lunar Science Conference, 5th, Houston, Tex., March 18-22, 1974, Proceedings. Volume 1 - Mineralogy and petrology. Volume 2 - Chemical and isotope analyses. Organic chemistry. Volume 3 - Physical properties.** Conference sponsored by NASA and Lunar Science Institute. Edited by W. A. Gose (Lunar Science Institute, Houston; Texas, University, Galveston, Tex.). New York, Pergamon Press, Inc. *(Geochimica et Cosmochimica Acta*, Supplement 5), 1974. Vol. 1, 1027 p.; vol. 2, 1307 p.; vol. 3, 914 p. Price of three volume, $100.

Numerous studies on the properties of the moon based on Apollo findings and samples are presented. Topics treated include ages of the lunar nearside light plains and maria, orange material in the Sulpicius Gallus formation at the southwestern edge of Mare Serenitatis, impact-induced fractionation in the lunar highlands, igneous rocks from Apollo 16 rake samples, experimental liquid line of descent and liquid immiscibility for basalt 70017, ion microprobe mass analysis of plagioclase from 'non-mare' lunar samples, grain size and the evolution of lunar soils, chemical composition of rocks and soils at Taurus-Littrow, the geochemical evolution of the moon, U-Th-Pb systematics of some Apollo 17 lunar samples and implications for a lunar basin excavation chronology, volatile-element systematics and green glass in Apollo 15 lunar soils, solar wind nitrogen and indigenous nitrogen in Apollo 17 lunar samples, lunar trapped xenon, solar flare and lunar surface process characterization at the Apollo 17 site, and the permanent and induced magnetic dipole moment of the moon.

S.J.M.

A75-40616 * **Exploration for fossil and nuclear fuels from orbital altitudes.** N. M. Short and H. A. Tiedemann (NASA, Goddard Space Flight Center, Earth Resources Branch, Greenbelt, Md.). In: Technology today for tomorrow; Proceedings of the Twelfth Space Congress, Cocoa Beach, Fla., April 9-11, 1975.
Cocoa Beach, Fla., Canaveral Council of Technical Societies, 1975, p. 5-11 to 5-18.

Studies of LANDSAT and Skylab-EREP data have defined both the advantages and limitations of space platforms as a new 'tool' in mineral exploration. One LANDSAT investigation in the Anadarko Basin of Oklahoma has demonstrated a correlation between several types of anomalies recognized in the imagery and the locations of known oil and gas fields. In addition to supporting several LANDSAT follow-on investigations in petroleum exploration, NASA has approved a broad in-house study at Goddard Space Flight Center designed to verify the general applicability of the initial Anadarko Basin results. Using both conventional photogeologic methods and special computer processing, imagery taken over oil-producing areas is being subjected to detailed analysis in search of definitive recognition criteria. (Author)

A75-41054 # **Some questions in the investigation of natural resources with the aid of space stations (Nekotorye voprosy issledovaniia prirodnykh resursov s pomoshch'iu kosmicheskikh stantsii).** Iu. P. Kienko and E. P. Arzhanov. *Geodeziia i Kartografiia*, May 1975, p. 58-62. In Russian.

Investigation of natural resources with the aid of orbiting space stations is discussed. Experimental surveys conducted by the Saliut space station are described, and the kinds of information obtained in these surveys are summarized. Possibilities are considered of using such surveys for constructing thematic and physical-relief maps.

F.G.M.

A75-42481 **The earth.** R. Siever (Harvard University, Cambridge, Mass.). *Scientific American*, vol. 233, Sept. 1975, p. 82-90.

The physical evolution of the earth is discussed. Two alternate theories on the origin of the earth are considered: (1) gradual condensation and accretion of the solid planet out of small particles from the primitive nebular disk and (2) gradual condensation of the solar nebula with crystallization of the heavy elements occurring while the lighter ones were still gaseous. Differentiation into the core, mantle, and crust is described together with the inception of volcanic activity and mountain building, changes in atmospheric composition, condensation of the oceans, and erosion processes. The earth's later evolution is reviewed on the basis of the geological record, and the theory of plate tectonics is briefly summarized. The origins and evolution of terrestrial life are discussed in detail. Full consideration is given to polar wandering, glaciation, and continental drift. F.G.M.

A75-44608 * **Coal refuse site inventories.** F. J. Wobber (IBM Corp., Gaithersburg, Md.), C. E. Wier (Indiana Geological Survey, Bloomington, Ind.), T. Leshendok (U.S. Environmental Protection Agency, Washington, D.C.), and W. Beeman (Indiana Coal Association, Terre Haute, Ind.). *Photogrammetric Engineering and Remote Sensing*, vol. 41, Sept. 1975, p. 1163-1171. NASA-sponsored research.

Small-scale color-infrared aerial photography at 1:120,000 scale is used to carry out an operational survey of coal refuse sites. Site analyses and reclamation cost estimates are completed in less than 90 days by using remote sensing techniques. Analysis of photographs provided dependable and accurate data for the location and environmental assessment of nearly 200 coal refuse banks and slurry ponds. The inventory constitutes a comprehensive reference for establishing priorities for coal refuse site reclamation and for complementing future field surveys. S.D.

A75-45260 **Contour strip mine detection and identification with imaging radar.** R. A. Shuchman, C. F. Davis, and P. L. Jackson (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: International Radar Conference, Arlington, Va., April 21-23, 1975, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 516-521. 6 refs. U.S. Bureau of Mines Contract No. SO241056.

A75-47621 LANDSAT data - A new perspective for geology. R. N. Baker (General Electric Co., Space Div., Beltsville, Md.). *Photogrammetric Engineering and Remote Sensing,* vol. 41, Oct. 1975, p. 1233-1239. 16 refs.

The LANDSAT (formerly ERTS) program has been used as an operational orbital remote-sensing system providing data of considerable value to various branches of geology. Areas in which the satellite imagery has been found most useful include regional interpretations of geologic structure, updating and verifying of geologic maps, mineral and petroleum exploration, and the monitoring of natural hazards such as large-scale erosion and seismicity. Investigations in these areas of application demonstrate the wide variety of uses presently undertaken or envisioned for the future. Many benefits will be seen in the near future when the promise of mineral or petroleum concentration will be realized through conventional ground-based and satellite exploration techniques, and LANDSAT will aid considerably in pinpointing the likely site. (Author)

A75-47622 * Geology and forestry classification from ERTS-1 digital data. R. D. Lawrence and J. H. Herzog (Oregon State University, Corvalis, Ore.). *Photogrammetric Engineering and Remote Sensing,* vol. 41, Oct. 1975, p. 1241-1245, 1247-1251. 12 refs. Contract No. NAS5-21831.

Computer classifications into seven and ten classes of two areas in central Oregon of interest to geology and forestry demonstrate the extraction of information from ERTS-1 data. The area around Newberry Caldera was classified into basalt, rhyolite obsidian, pumice flats, Newberry pumice, ponderosa pine, lodgepole pine, and water classes. The area around Mt. Washington was classified into two basalts, three forest, two clearcut, burn, snow, and water classes. Both also include an unclassified category. Significant details that cannot be extracted from photographic reconstitutions of the data emerge from these classifications, such as moraine locations and paleowind directions. Spectral signatures for the various rocks are comparable to those published elsewhere. (Author)

N75-28254# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
CRUDE OIL CHARACTERIZATION DATA PROGRAM Interim Report
E. A. Frame, E. C. Owens, and F. M. Newman Jul. 1974 50 p
(Contract DAAK02-73-C-0221)
(AD-A005076; AFLRL-35) Avail: NTIS CSCL 21/4

A computer program has been written which allows rapid retrieval and selection of CONUS and OCONUS crude oil characterization data. The computer program is conversational and permits use by personnel not experienced in computer operations. Crude oils are selected by using up to 14 categories of crude oil characterization data, including geographic location, production rate, reserves quantity and physical properties. GRA

N75-28484*# New Mexico State Bureau of Mines and Mineral Resources, Socorro.
EARTH RESOURCES EVALUATION FOR NEW MEXICO BY LANDSAT-2 *Progress Report,* 27 Feb. - 31 May 1975
Karl VonderLinden, Principal Investigator, Sandra C. Feldman, Michael H. Inglis, David Tabet, and Frank E. Kottlowski 31 May 1975 5 p ERTS
(Contract NAS5-20916)
(E75-10346; NASA-CR-143148) Avail: NTIS HC $3.25 CSCL 08F

The author has identified the following significant results. A cost effective technique is considered for measuring and monitoring surface area fluctuations in lake size in southeastern New Mexico over a two year period. The lakes are shallow, and therefore a small volume increase results in a noticeable increase in surface area on the LANDSAT imagery. Lake sizes are measured on an I(2)S Digicol viewer. Water from potash mining operations is being pumped into some of these lakes and the input volume is documented. Using water input and surface contour as well as direct lake level measurements as ground truth as well as the LANDSAT images, calculations may be possible regarding how much additional industrial water can be added to these lakes without the occurrence of saline see page into the major river system.

N75-28485*# Earth Satellite Corp., Washington, D.C.
APPLICATION OF LANDSAT-2 DATA TO THE IMPLEMENTATION AND ENFORCEMENT OF THE PENNSYLVANIA SURFACE MINING CONSERVATION AND RECLAMATION ACT Progress Report, 19 Mar. - 19 Jun. 1975
Daniel J. Deely, Principal Investigator 19 Jun. 1975 6 p ERTS
(Contract NAS5-21998)
(E75-10347; NASA-CR-143149; C-1037-II-1) Avail: NTIS HC $3.25 CSCL 08I

N75-28487*# Wyoming Univ., Laramie. Dept. of Geology.
SELENIUM IN SOILS OF THE LOWER WASATCH FORMATION, CAMPBELL COUNTY, WYOMING: GEOCHEMISTRY, DISTRIBUTION, AND ENVIRONMENTAL HAZARDS
Kenneth E. Kolm 6 Jun. 1975 114 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21799)
(E75-10349; NASA-CR-143151) Avail: NTIS HC $5.25 CSCL 08G

The author has identified the following significant results. Seleniferous Shingle series soils and sandstone outcrops of section 27, T 48 N, R 71 W, Wyoming are mapped on aerial photography by their association with Astragalus bisulcatus. Chemical leachate analyses and atomic absorption methods reveal all studied Samsil and Shingle soils to contain acid, base, and water soluble selenium compounds, and that water extractions showed varied concentration behavior due to soil pH. Acid-soluble selenium is found to be associated with smectite. Statistical analyses confirm that A. bisulcatus presence has a weak influence on soil-lens organic selenium concentration, and determine the importance of other geobotanical factors for convertor presence. Environmental procedures of high selenium lens burial, convertor plant eradication, and revegetated site monitoring are recommended. Usage of density analysis and photographic enlargement are used to successfully produce both a control area and a Campbell County, Wyoming regional map of A. bisulcatus supportive soils and outcrops using Skylab photography.

N75-28515# Bureau of Mines, Laramie, Wyo. Energy Research Center.
COMPOSITIONAL VARIATIONS OF ORGANIC MATERIAL FROM GREEN RIVER OIL SHALE-WOSCO EX-1 CORE (UTAH)
W. E. Robinson and G. L. Cook Mar. 1975 46 p refs
(PB-241244/3; BM-RI-8017) Avail: NTIS HC $3.75 CSCL 08D

The composition or chemical structure of the organic material in samples of Uinta Basin (Utah) oil shale were studied relative to stratigraphic position within the Green River Formation. This involved a systematic study of the soluble organic material and the insoluble organic material (Kerogen) present in the samples Emphasis was placed upon the distribution of the alkanes in the soluble extracts and upon the aromaticity of the kerogen. Significant differences exist in the chemical composition of the organic material from various strata within the Uinta Basin, some of which were related to burial depth but most were related to source material variations, or environmental differences. GRA

N75-29526*# Saint Lawrence Univ., Canton, N.Y. Dept. of Geology and Geography.
INVESTIGATION OF RELATIONSHIPS BETWEEN LINEARS, TOTAL AND HAZY AREAS, AND PETROLEUM PRODUCTION IN THE WILLISTON BASIN: AN ERTS APPROACH Final Report
J. Mark Erickson, James S. Street, Principal Investigators, Cynthia J. Munsell, and Douglas E. OBrien Aug. 1975 63 p refs ERTS

(Grant NsG-5018)
(E75-10384; NASA-CR-143246) Avail: NTIS HC $4.25 CSCL 08G

The author has identified the following significant results. ERTS-1 imagery in a variety of formats was used to locate linear, tonal, and hazy features and to relate them to areas of hydrocarbon production in the Williston Basin of North Dakota, eastern Montana, and northern South Dakota. Derivative maps of rectilinear, curvilinear, tonal, and hazy features were made using standard laboratory techniques. Mapping of rectilinears on both bands 5 and 7 over the entire region indicated the presence of a northeast-southwest and a northwest-southeast regional trend which is indicative of the bedrock fracture pattern in the basin. Curved lines generally bound areas of unique tone, maps of tonal patterns repeat many of the boundaries seen on curvilinear maps. Tones were best analyzed on spring and fall imagery in the Williston Basin. It is postulated that hazy areas are caused by atmospheric phenomena. The ability to use ERTS imagery as an exploration tool was examined where petroleum and gas are presently produced (Bottineau Field, Nesson and Antelope anticlines, Redwing Creek, and Cedar Creek anticline). It is determined that some tonal and linear features coincide with location of present production in Redwing and Cedar Creeks. In the remaining cases, targets could not be sufficiently well defined to justify this method.

N75-29541# Wilkes Coll., Wilkes-Barre, Pa.
REMOVAL OF MANGANESE FROM MINE DRAINAGE BY OZONE AND CHLORINE Final Report
Ralph B. Rozelle and Howard A. Swain, Jr. Mar. 1975 57 p refs
(Contract EPA-R-801236)
(PB-241143/7; EPA-670/2-75-006) Avail: NTIS HC $4.25 CSCL 07A

Methods by which coal mine water could be treated for removal of manganese are examined. In order to remove manganese from mine water, strong oxidizers must be employed to oxidize it to the (+4) oxidation state in which it is relatively insoluble and will precipitate as MnO_2. Both ozone and hypochlorite ion were effective in this oxidation and reduced manganese concentrations to less than 2 mg/l and in some cases to less than 0.05 mg/l. Reaction orders based on initial reaction rates are reported for the manganese (II) at pH values of 2, 4, 6 and 7.9 in the time intervals studied. Solubilities of both manganese (II) hydroxide and manganese (IV) oxide were measured. Cost data were developed for both the ozone and sodium hypochlorite treatment. GRA

N75-29545# Bureau of Mines, Twin Cities, Minn. Twin Cities Mining Research Center.
EXTRACTING MINERALS FROM GEOTHERMAL BRINES: A LITERATURE STUDY Information Circular, 1974
Rolland L. Blake Dec. 1974 30 p refs
(PB-240681/7; BM-IC-8638) Avail: NTIS HC $3.75 CSCL 08I

The Bureau of Mines is concerned with extracting minerals from residual geothermal brines after their heat content and some demineralized water have been recovered. The potential of the domestic geothermal mineral resources, is examined along with the technical problems involved. Possible effects on the environment from reservoir fluid withdrawal and reinjection are outlined. GRA

N75-30618*# California Earth Science Corp., Santa Monica.
FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly Progress Report, Aug. 1975
Paul M. Merifield, Principal Investigator 5 Aug. 1975 2 p refs EREP
(Contract NAS2-7968)
(E75-10385; NASA-CR-143291; MPR-26) Avail: NTIS HC $3.25 CSCL 08G

N75-30619*# Geological Survey, Reston, Va.
ION-ABSORPTION BAND ANALYSIS FOR THE DISCRIMINATION OF IRON-RICH ZONES Progress Report, 1 Jul. 1972 - 1 Aug. 1974
Lawrence C. Rowan, Principal Investigator and Pamela H. Wetlaufer 15 Dec. 1974 201 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NASA Order S-70243-AG)
(E75-10380; NASA-CR-143292) Avail: NTIS HC $7.25 CSCL 08G

The author has identified the following significant results. A technique which combines digital computer processing and color composition was devised for detecting hydrothermally altered areas and for discriminating among many rock types in an area in south-central Nevada. Subtle spectral reflectance differences among the rock types are enhanced by ratioing and contrast-stretching MSS radiance values for form ratio images which subsequently are displayed in color-ratio composites. Landform analysis of Nevada shows that linear features compiled without respect to length results in approximately 25 percent coincidence with mapped faults. About 80 percent of the major lineaments coincides with mapped faults, and substantial extension of locally mapped faults is commonly indicated. Seven major lineament systems appear to be old zones of crustal weakness which have provided preferred conduits for rising magma through periodic reactivation.

N75-30662# Montana State Univ., Bozeman. Water Resources Research Center.
WATER USE AND COAL DEVELOPMENT IN EASTERN MONTANA. WATER AVAILABILITY AND DEMANDS
Richard L. Stroup and Stuart B. Townsend Dec. 1974 98 p refs
(Contract DI-14-31-0001-4217)
(PB-241332/6; MUJWRRC-59; W75-06979;
OWRT-C-5258-MONT(2)) Avail: NTIS HC $4.75 CSCL 13B

A one-year, two-phase study was undertaken to assess the availability and demand for water in the coal region of eastern Montana. The physical availability of surface and groundwater was treated, as were the legal problems associated with coal development, broken down by type of development. Data presented indicate that sufficient groundwater is available in eastern Montana to permit substantial amounts of coal development. Use of this water would not be without cost, however. Direct costs of impoundment and delivery, and foregone opportunities for using the water instream must be considered. The demand for water in coal development will depend in part on the cost of water to developers. GRA

N75-30706# Council for Scientific and Industrial Research, Pretoria (South Africa).
A COMPARISON BETWEEN MAPPING OF GEOLOGICAL DISCONTINUITIES AND SEISMIC MEASUREMENTS
E. Brueckl and W. Fuerlinger 1974 14 p refs Transl. into ENGLISH from Z. fuer Geophysik (West Germany), v. 39, 1973 p 291-302
(CSIR-Trans-1199) Avail: NTIS HC $3.25

The comparison of the mapping of geological discontinuities with seismic measurement showed that both experimental methods can benefit from simultaneous application. If in seismic plotting a relation is set up between the jointing coefficient and the longitudinal wave velocity in a lithologically homogeneous region, a quick and objective method for further determining the two jointing coefficients for a rock mass may be obtained. A comparison with the mapping of discontinuities offers seismology the possibility of calculating the longitudinal wave velocity in non-jointed rock. Furthermore, the calculation of relative jointing coefficients or joint intensities from the Schmidt plot makes a qualitative prediction of the seismic anisotropy possible. The influence of joints on the longitudinal wave velocity in the area investigated was very great due to the intense karstification and shallow penetration depth of the seismic waves, but the effect should also be considered in less obviously jointed rock together with its lithologic properties in the discussion of seismic anisotropy. The investigation covered the eastern area of the Hochkonig massif in the county of Salzburg. Author

N75-30764# Army Engineer Topographic Labs., Fort Belvoir, Va.

PHOTO-GEOMORPHOLOGY OF COASTAL LANDFORMS, CAT ISLAND, BAHAMAS, VOLUME 2

A. O. Lind Jan. 1974 53 p refs

(AD-A008954; ETL-SR-74-5-Vol-2) Avail: NTIS CSCL 08/6

The report provides the aerial imagery used in the analysis of the coastal landforms of Cat Island in the east-central Bahama Islands. Interpretive maps and a brief description of the significant aspects of the coastal terrain are presented. The report is intended to complement the author's published volume Coastal Landform of Cat Island, Bahamas: A Study of Holocene Accretionary Topography and Sea-Level Change but may also serve as an independent document for military geographic intelligence and general photo-interpretation of coastal terrains. GRA

N75-31555# Committee on Interior and Insular Affairs (U. S. House).

CIRCUM-PACIFIC ENERGY AND MINERAL RESOURCES CONFERENCE

Washington GPO 1974 115 p refs Hearings before Subcomm. on Mines and Mining of Comm. on Interior and Insular Affairs, 93d Congr., 2d Sess., held in Honolulu, Hawaii, 27 and 29 Aug. 1974

(GPO-41-023) Avail: Subcomm. on Mines and Mining

Geothermal and mineral resources in the Pacific Ocean area are investigated. Utilization of geothermal energy for space heating and electric power generation is discussed. Examples of existing systems, potential for further development, and associated environmental effects are examined. In addition, data are presented concerning the distribution on the Pacific Ocean floor of manganese nodules which are enriched with iron, nickel, cobalt and copper. Possibilities for mining the nodules are considered. D.M.L.

N75-31558*# Scientific Translation Service, Santa Barbara, Calif.

INVESTIGATION OF EARTH RESOURCES BY SPACE MEANS. PART 1. METHODS OF MEASUREMENT AND PROCESSING OF INFORMATION

Yu. K. Khodarev, ed. and Ya. L. Ziman ed. Washington NASA Sep. 1975 174 p Transl. into ENGLISH from Acad. of Sci. (Moscow), 1975 164 p

(Contract NASw-2791)

(NASA-TT-F-16484) Avail: NTIS HC $6.25 CSCL 05B

Techniques of remote recording of the earth, areas for surveillance, and the construction of flying laboratories on aircraft for carrying out experiments have been investigated, as well as the processing of data resulting from these observations. The utilization of this data was also discussed. Reports were presented concerning how such information could be beneficial in solving economic problems through more efficient use of the earth's natural resources. Author

N75-32574*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

GEOLOGICAL MAPPING IN NORTHWESTERN SAUDI ARABIA USING LANDSAT MULTISPECTRAL TECHNIQUES

H. W. Blodget, G. F. Brown (Geological Survey, Reston, Va.), and J. G. Moik (Computer Sciences Corp., Silver Spring, Md.) Aug. 1975 26 p refs Submitted for publication

(NASA-TM-X-70961; X-923-75-206) Avail: NTIS HC $3.75 CSCL 08B

Various computer enhancement and data extraction systems using LANDSAT data were assessed and used to complement a continuing geologic mapping program. Interactive digital classification techniques using both the parallel-piped and maximum-likelihood statistical approaches achieve very limited success in areas of highly dissected terrain. Computer enhanced imagery developed by color compositing stretched MSS ratio data was constructed for a test site in northwestern Saudi Arabia. Initial results indicate that several igneous and sedimentary rock types can be discriminated. Author

N75-32579# Hazen Research, Inc., Golden, Colo.

PROCESS TECHNOLOGY FOR RECOVERING GEOTHERMAL BRINE MINERALS

C. E. Berthold, Pablo Hadzeriga, David H. Christopher, Thomas A. Applegate, and Daniel M. Gillespie 4 Feb. 1974 255 p refs

(Contract DI-BM-SO-133084)

(PB-241867/1; BM-OFR-35-75) Avail: NTIS HC $8.50 CSCL 08I

Geothermal fluids and hot springs waters from California and Nevada were sampled and analyzed to provide a basis for process development and economic studies on the potential for recovering valuable minerals from these fluids. In general, bulk precipitation methods were used to remove the valuable constituents from the geothermal fluids, followed by separation of the constituents from this bulk precipitate. Concentration of geothermal fluids to recover soluble saline constituents such as sodium chloride and calcium chloride does not appear practical, owing primarily to the probable need for reinjecting such fluids back into the production zone. GRA

N75-32629# Bureau of Mines, Bartlesville, Okla. Energy Research Center.

CRUDE OIL SPILLS RESEARCH. AN INVESTIGATION AND EVALUATION OF ANALYTICAL TECHNIQUES

C. A. Wilson, E. P. Ferrero, and H. J. Coleman Apr. 1975 35 p refs

(PB-242128/7; BM-RI-8024) Avail: NTIS HC $3.75 CSCL 07C

Analytical techniques were investigated and evaluated to assist governmental agencies to select simple, rapid, reliable methods for crude oil spill identification. Six crude oil samples were analyzed to evaluate gas-liquid chromatography, atomic absorption spectrophotometry, infrared spectroscopy, sulfur and nitrogen determinations, mass spectrometry, nuclear magnetic resonance spectroscopy, and ultraviolet spectrophotometry. Samples were studied from various selected fields which are likely to be involved in oceanic transport. Gas-liquid chromatographic analysis, atomic absorption spectrophotometric analysis, and sulfur-nitrogen determinations are recommended as the most useful of the techniques investigated. GRA

N75-33458*# Technische Universitaet, Clausthal-Zellerfeld (West Germany).

MAPPING OF LITHOLOGIC AND STRUCTURAL UNITS USING MULTISPECTRAL IMAGERY Final Report, Aug. 1973 - Mar. 1974

Peter Kronberg, Principal Investigator Apr. 1974 32 p refs Presented at German Geol. Soc. Fall Meeting, Oct. 1973 and at the ESRO-Symp. on European Earth Resources Experiments, Frascati, Italy, Feb. 1974 and at the Intern. Afar-Symp., Bad Bergzabern, West Germany, Apr. 1974 Submitted for publication Sponsored by NASA EREP

(E75-10403; NASA-CR-144396; Rept-3) Avail: NTIS HC $3.75 CSCL 08B

The author has identified the following significant results. ERTS-1 MSS imagery covering the Afar-Triangle/Ethiopia and adjacent regions (Ethiopian Plateau, Somali Plateau, and parts of Yemen and Saudi Arabi) was applied to the mapping of lithologic and structural units of the test area at a scale 1:1,000,000. Results of the geological evaluation of the ERTS-1 imagery of the Afar have proven the usefullness of this type of satellite data for regional geological mapping. Evaluation of the ERTS images also resulted in new aspects of the structural setting and tectonic development of the Afar-Triangle, where three large rift systems, the oceanic rifts of the Red Sea and Gulf of Aden and the continental East African rift system, seem to meet each other. Surface structures mapped by ERTS do not indicate that the oceanic rift of the Gulf of Aden (Sheba Ridge) continues into the area of continental crust west of the Gulf of Tadjura. ERTS data show that the Wonji fault belt of the African rift system does not enter or cut through the central Afar. The Aysha-Horst is not a Horst but an autochthonous spur of the Somali Plateau.

N75-33465*# International Inst. for Aerial Survey and Earth Sciences, Enschede (Netherlands).
EVALUATION OF EREP TECHNIQUES FOR GEOLOGICAL MAPPING: SUMMARY STATEMENTS
H. E. C. vanderMeerMohr and G. S. Srivastava, Principal Investigators Aug. 1975 4 p ref Sponsored by NASA EREP
(E75-10410; NASA-CR-143403) Avail: NTIS HC $3.25 CSCL 08B

N75-33466*# California Earth Science Corp., Santa Monica.
FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly Progress Report, Sep. 1975
Paul M. Merifield, Principal Investigator Sep. 1975 2 p ref EREP
(Contract NAS2-7698)
(E75-10411; NASA-CR-143404; MPR-27) Avail: NTIS HC $3.25 CSCL 08E

N75-33478*# International Inst. for Aerial Survey and Earth Sciences, Enschede (Netherlands).
EVALUATION OF EREP TECHNIQUES FOR GEOLOGICAL MAPPING Final Report, Aug. 1974 - Aug. 1975
H. E. C. VanDerMeerMohr and G. S. Srivastava, Principal Investigators Aug. 1975 68 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(E75-10423; NASA-CR-143411) Avail: NTIS HC $4.25 CSCL 08B

The author has identified the following significant results. Skylab photographs may be successfully utilized for preparing a reconnaissance geological map in the areas where no maps or semi-detailed maps exist. Large coverage of area and regional perspective from Skylab photographs can help better coordination in regional mapping. It is possible to delineate major structural trends and other features like mega-lineaments, geofractures, and faults, which have evaded their detection by conventional methods. The photointerpretability is better in areas dominated by sedimentary rocks. Rock units of smaller extent and having poor geomorphic expressions are difficult to map. Demarcation of quaternary river alluvium can be made with better precision and ease with the Skylab photographs. Stereoscopic viewing greatly helps in interpretation of area structures. Skylab photographs are not good for preparing geological maps larger than 1:270,000 scale.

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OCEANOGRAPHY AND MARINE RESOURCES

Includes sea-surface temperature, ocean bottom surveying imagery, drift rates, sea ice and icebergs, sea state, fish location.

A75-40608 * **Ocean color measurement from high altitude.** W. A. Hovis, Jr. (NASA, Goddard Space Flight Center, Earth Observation Systems Div., Greenbelt, Md.). In: Technology today for tomorrow; Proceedings of the Twelfth Space Congress, Cocoa Beach, Fla., April 9-11, 1975. Cocoa Beach, Fla., Canaveral Council of Technical Societies, 1975, p. 3-9 to 3-14. 5 refs.

Investigations into the feasibility of sensing ocean color from high altitude for determination of chlorophyll and sediment distributions have been carried out using sensors on NASA aircraft, coordinated with surface measurements carried out by oceanographic vessels. Spectrometer measurements in 1971 and 1972 led to development of an imaging sensor now flying on a NASA U-2 and the Coastal Zone Color Scanner to fly on Nimbus G in 1978. Results of the U-2 effort have shown the imaging sensor to also be of great value in sensing pollutants in the ocean. (Author)

A75-40609 **Satellite oceanography - Recent developments and future plans in NOAA's environmental satellite program.** A. E. Strong and E. P. McClain (NOAA, National Environmental Satellite Service, Washington, D.C.). In: Technology today for tomorrow; Proceedings of the Twelfth Space Congress, Cocoa Beach, Fla., April 9-11, 1975. Cocoa Beach, Fla., Canaveral Council of Technical Societies, 1975, p. 3-15 to 3-21. 19 refs.

NOAA's National Environmental Satellite Service is bringing to the attention of the oceanographic community synoptic visible and thermal-infrared overviews of the nearby oceans. Twice-daily information is possible from the polar-orbiting NOAA satellites and half-hourly imagery from the new Synchronous Meteorological Satellites (SMS). Very high resolution radiometer (VHRR) data from operational NOAA satellites provide 1-km resolution infrared images enabling routine and detailed analysis of the Gulf Stream, Loop Current, west coast upwelling, and Great Lakes surface temperatures during periods that are relatively cloud-free. SMS provides 4-km resolution thermal data of most of the Western Hemisphere from a fixed vantage point over the Equator. Visible band data from NOAA and SMS satellites have found their greatest use in the monitoring of sea and lake ice and in pursuing some studies of ocean roughness. Modifications are slated for instrumentation on both the NOAA and SMS satellites during the next few years. These alterations should improve the accuracy of sea surface temperature measurements from space. (Author)

A75-42771 **Analysis of Cladophora distribution in Lake Ontario using remote sensing.** C. T. Wezernak and D. R. Lyzenga (Michigan, Environmental Research Institute, Ann Arbor, Mich.). *Remote Sensing of Environment*, vol. 4, no. 1, 1975, p. 37-48. U.S. Environmental Protection Agency Grant No. 800778.

Multispectral remote sensing data were collected along the U.S. shoreline of Lake Ontario as part of the International Field Year on the Great Lakes (IFYGL) program in Lake Ontario. Data were processed to show the distribution of Cladophora (benthic algae) in the nearshore zone and to estimate the standing crop. The present report deals with Cladophora distribution in the region from Niagara to Rochester, New York. The results show an extensive growth and development of Cladophora in the study area. Approximately 66% of a 350 meter wide nearshore bottom zone in the western portion of the lake is covered by Cladophora. The results demonstrate the potential of remote sensing technology for determining the distribution of benthic communities. (Author)

A75-45788 # **Results of complementary EOLE experiments.** A. Detape (Centre National d'Etudes Spatiales, Toulouse, France) and P. Guerit (Centre National d'Etudes Spatiales, Paris, France). *International Astronautical Federation, International Astronautical Congress, 26th, Lisbon, Portugal, Sept. 21-27, 1975, Paper 75-136.* 21 p. 6 refs.

The EOLE satellite system was used in a series of buoy and iceberg tracking experiments to investigate marine currents. Buoys with parachute drogues immersed to varying depths were equipped with light EOLE transponders having low-energy (3-4 W) transmitters to communicate geographic position and data on air and water temperature and air pressure from 3-4 sensors. Tracking was accomplished with varying degrees of success for buoys released in a number of locations. Trajectories of three Antarctic icebergs obtained in tracking experiments are given. C.K.D.

A75-46675 **Case study of exchange processes on the western boundary of the Gulf Stream using NOAA-2 satellite data and ship data.** F. M. Vukovich and B. W. Crissman (Research Triangle Institute, Research Triangle Park, N.C.). *Remote Sensing of Environment*, vol. 4, no. 2, 1975, p. 165-176. 6 refs. Grant No. NOAA-3-35402.

N75-28660*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DUAL FREQUENCY SCATTEROMETER MEASUREMENT OF OCEAN WAVE HEIGHT
J. W. Johnson, W. L. Jones, C. T. Swift, W. L. Grantham, and D. E. Weissman 8 Jul. 1975 23 p ref Presented at 1974 USNC/URSI Meeting, Boulder, Colo., 14-17 Oct. 1974
(NASA-TM-X-72752) Avail: NTIS HC $3.25 CSCL 08C

A technique for remotely measuring wave height averaged over an area of the sea surface was developed and verified with a series of aircraft flight experiments. The measurement concept involves the cross correlation of the amplitude fluctuations of two monochromatic reflected signals with variable frequency separation. The signal reflected by the randomly distributed specular points on the surface is observed in the backscatter direction at nadir incidence angle. The measured correlation coefficient is equal to the square of the magnitude of the characteristic function of the specular point height from which RMS wave height can be determined. The flight scatterometer operates at 13.9 GHz and 13.9 - delta f GHz with a maximum delta f of 40 MHz. Measurements were conducted for low and moderate sea states at altitudes of 2, 5, and 10 thousand feet. The experimental results agree with the predicted decorrelation with frequency separation and with off-nadir incidence angle.
Author

N75-29642 GATE Operational Control Centre, Dakar (Senegal).
ATMOSPHERIC DISTURBANCES OVER THE ATLANTIC GATE AREA AS SEEN FROM SATELLITE DATA
R. F. Burlutsky *In* WMO Prelim. Sci. Results of the GARP Atlantic Trop. Expt., Vol. 2 Jan. 1975 p 23-40

The disturbances in the ITCZ and outside the ITCZ are discussed, based on satellite imagery and motion picture loops. It is found that the ITCZ in the Atlantic is intrinsically rather stable, and its changes are strongly related to the noon northern activity. The continental tropical and maritime air forms a discontinuity of a baroclinic type in the lower part of the troposphere above the trade wind inversion, which is responsible for much of the cyclonic activity in 16-20 N of the Atlantic and the ITCZ evolution as well. So-called easterly waves and inverted V patterns are not good descriptions of synoptic features. ESRO

N75-30526* Delaware Univ., Newark.
REQUIREMENTS FOR AIRBORNE LASER SYSTEMS USED IN COASTAL STUDIES
V. Klemas *In* NASA. Wallops Station The Use of Lasers for Hydrographic Studies 1975 p 35-46 refs

CSCL 20E

Requirements for airborne laser systems are considered for the following applications: (1) photo-optical determination of shallow water wave spectra; (2) bathymetry in highly turbid waters; (3) chlorophyll concentration monitoring; and (4) oil dispersion mapping. Author

N75-30532* Avco-Everett Research Lab., Everett, Mass.
REMOTE MEASUREMENT OF OCEAN TEMPERATURE FROM DEPOLARIZATION IN RAMAN SCATTERING
Chin H. Chang and Lee A. Young *In* NASA. Wallops Station The Use of Lasers for Hydrographic Studies 1975 p 105-112 refs
CSCL 20E

Ocean temperatures may be mapped in three dimensions from an aircraft down to depths of 2 to 4 attenuation lengths by monitoring Raman radiation backscattered from a laser beam. This paper describes laboratory experiments on the temperature dependence of Raman spectra of saline solutions and calculations of the expected performance of a field system. The Raman technique is of greatest potential utility in coastal and estuarine waters where gradients are relatively high. It is estimated that seawater temperature may be measured to a statistical precision of 0.5 C at depths to four attenuation lengths in two meter water, using one Joule of transmitted laser energy. Author

N75-30533* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MEASUREMENT OF RAMAN SPECTRA OF H2O AND SO4(-) IN SEAWATER
William M. Houghton *In its* The Use of Lasers for Hydrographic Studies 1975 p 113-118

CSCL 20E

A study of applying laser Raman spectroscopy to remote sensing of the sulfate ion in sea water is in progress. The SO4 Raman spectrum has been obtained from true sea water samples in the laboratory using a CW laser Raman spectrometric system. Radiometric calculations indicate the feasibility of obtaining usable SO4 Raman signals in a field experiment. One of serious difficulties expected in the field experiment would be from fluorescence of phytoplankton and organics. Author

N75-30536* Massachusetts Univ., Gloucester.
THE FLUORESCENCE OF CHLOROPHYLL AND YELLOW SUBSTANCES IN NATURAL WATERS: A NOTE ON THE PROBLEMS OF MEASUREMENT AND THE IMPORTANCE OF THEIR REMOTE SENSING
Charles S. Yentsch *In* NASA. Wallops Station The Use of Lasers for Hydrographic Studies 1975 p 147-152

CSCL 20E

There are two chromophylls which, if sensed remotely from high altitude, would revolutionize the ability to survey large areas of the world's oceans. The chromophylls of importance are: the photosynthetic pigments of plankton algae and a group of organic materials frequently termed dissolved yellow substances. These are derived from plants and carried into the ocean by fresh water inflow. The attenuation of light by phytoplankton is characterized by two distinctive bands (450, 675 nm) which represent absorption by chloroplastic pigments. Yellow substances are characterized by a strong ultraviolet absorption which tails over into the visible region. It is emphasized that chlorophyll determination could be a unique technique for estimating the extent of eutrophication in coastal waters, and that a high altitude observer equipped with temperature, chlorophyll and yellow substance sensors has the possibility of detecting the magnitude of eutrophication and its sources by using laser induced fluorescent devices. Author

N75-30758*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SEA SURFACE DETERMINATION FROM SPACE: THE GSFC GEOID
F. O. Vonbun, J. McGoogan, J. Marsh, and F. Lerch Aug. 1975 14 p refs Presented at the 1974 USNC/URSI- IEEE Meeting, Boulder, Colo., 14-17 Oct.
(NASA-TM-X-70959; X-900-75-216) Avail: NTIS HC $3.25 CSCL 08J

The determination of the sea surface/geoid and its relative variation were investigated and results of the altimeter experiment on Skylab to test the geoid are discussed. The spaceborne altimeter on Skylab revealed that the sea surface of the world's oceans can be measured with an accuracy in the meter range. Surface variations are discussed as they relate to those computed from satellite orbital dynamics and ground based gravity data. The GSFC geoid was constructed from about 400,000 satellite tracking data (range, range rate, angles) and about 20,000 ground gravity observations. One of the last experiments on Skylab was to measure and/or test this geoid over almost one orbit. It was found that the computed water surface deviates between 5 to 20 m from the measured one. Further outlined are the influence of orbital errors on the sea surface, and numerical examples are given based upon real tracking data. Orbital height error estimates were computed for geodetic type satellites and are found to be in the order of 0.2 to 5 meters. Author

N75-30762# Office of Naval Research, London (England).
EUROPEAN SYMPOSIUM ON OCEAN DATA ACQUISITION SYSTEMS
F. N. Spiess 5 Dec. 1974 27 p refs Conf. held at Southampton, Engl., 16-18 Sep. 1974
(AD-A006029; ONRL-C-8-74) Avail: NTIS CSCL 08/3

The European Ocean Data Acquisition Systems Symposium involved primarily northern European participants and focused its attention on systems involving buoys. Papers and discussion covered a variety of buoy types, small and large, as well as instrumentation, data transmission (heavy emphasis on satellite relay) and operational aspects. Geographically the North Sea was the center of attention, although work in other areas (all within a thousand mile radius of Southampton) was presented. GRA

N75-30763# Coast Guard Research and Development Center, Groton, Conn.
CHARACTERIZATION OF SLUSH ICE IN THE GREAT LAKES Final Report
James P. Welsh and Brian T. Kingsbury Nov. 1974 19 p
(AD-A006450; CGR/DC-34-74; USCG-D-45-75) Avail: NTIS CSCL 08/12

The purpose of the study was to identify characteristics of slush ice and to develop techniques for their measurement. Slush ice is a mixture of fresh water ice and water. It becomes an impediment to navigation when wind and water current transport the ice fragments into a restricted channel or harbor. The characteristics of slush ice identified and measured were draft, ice to water ratio (surface aspect only), and ice particle size distribution. Draft was measured using a sonar transducer set on the bottom of a channel and echoing off the underside of the slush ice. The water to ice ratio was obtained from photographs of slush ice taken from a helicopter. The ice particle size distribution was obtained by physically measuring ice particles in the field. GRA

N75-31298 Kansas Univ., Lawrence.
INVESTIGATION OF RADAR DISCRIMINATION OF SEA ICE Ph.D. Thesis
Surendra Kumar Parashar 1974 398 p
Avail: Univ. Microfilms Order No. 75-17655

The ability of radar to discriminate sea ice types and their thickness was studied. Radar backscatter measurements at 400 MHz (multi-polarization) and 13.3 GHz (VV Polarization) were analyzed in detail. The scatterometer data were separated into seven categories of sea ice according to age and thickness as interpreted from stereo aerial photographs. Although 400 MHz is not as satisfactory for ice identification as 13.3 GHz,

combining a 13.3 GHz and a 400 MHz system definitely eliminates the ambiguity regarding very thin ice. Four-polarization 16.5 GHz radar imagery was also obtained. Open water and three categories of sea ice can be identified on the images. The results of the imagery analysis are consistent with the radar scatterometer results. An analytical theory of radar scatter from sea ice was developed by taking into account the amount of brine entrapped, temperature, and surface roughness. Numerical calculations were performed for polarized radar backscatter for the six ice types at 400 MHz and 13.3 GHz. The computed results are in general agreement with the experimental results despite the fact that no 'ground truth' information was available. Dissert. Abstr.

N75-31691# National Environmental Satellite Service, Coral Gables, Fla. Satellite Field Services Station.
ATLANTIC TROPICAL CYCLONE CLASSIFICATIONS FOR 1974
Donald C. Gaby, Donald R. Cochran, James B. Lushine, Samuel C. Pearce, and Authur C. Pike Apr. 1975 12 p refs
(COM-75-10676/5; NOAA-TM-NESS-68; NOAA-75042803) Avail: NTIS CSCL 04B

Estimates of the locations and maximum sustained winds (classifications) of all named tropical cyclones in the North Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico during 1974 were made using the technique developed by Dvorak. This technique was applied to pictures from the SMS-1 (Stationary Meteorological Satellite) and ATS-3 (Advanced Technology Satellite) geostationary satellites. These estimates were compared with other data to establish the measure of accuracy achieved. The results are presented together with comments on expected future performance. GRA

N75-31705# Coastal Engineering Research Center, Fort Belvoir, Va.
ANALYSIS AND INTERPRETATION OF LITTORAL ENVIRONMENT OBSERVATION (LEO), AND PROFILE DATA ALONG THE WESTERN PANHANDLE COAST OF FLORIDA
James H. Balsillie Mar. 1975 104 p refs
(AD-A009755; CERC-TM-49) Avail: NTIS CSCL 08/6

In 1969, observation and profile stations were established along a 100-mile segment of the western panhandle coast of Florida. Visual measurements of littoral phenomena were taken using systematic techniques of the Littoral Environment Observation (LEO) Program. At six LEO stations, daily observations were made of breaker height, period, and direction of approach, longshore current speed and direction, and windspeed and direction. Foreshore slope was measured daily, and sand samples were collected monthly. Monthly profiles were measured from piers at six localities. Breaker heights were found to increase from east to west. Volume change between consecutive monthly profiles indicate net losses of sediment from the littoral zone along most of the study area, with only serious losses at one locality along the western segment. GRA

N75-32527 Joint Publications Research Service, Arlington, Va.
STUDY OF THE THERMAL RADIOWAVELENGTH EMISSION OF THE WATER SURFACE COVERED WITH OIL FILM

A. A. Glotov, D. T. Matveyev, V. G. Mirovskiy, M. D. Rayev, V. Yu. Rayzer, I. A. Troitskiy, Ye. A. Sharkov, and V. S. Etkin *In its* Meteorology and Hydrol., No. 6, 1975 (JPRS-65607) 4 Sep. 1975 p 115-119 refs Transl. into ENGLISH from Meteorol. Gidrolog. (Moscow), no. 6, 1975 p 90-93

Results are discussed from measuring the radio brightness temperature of a smooth wavy surface covered by a solar oil and kerosene film using a highly sensitive two-centimeter band radiometer. A comparison of the experimental and calculated values of the radio brightness temperature permitted unique determination of the film thickness and estimation of the unknown dielectric parameters of the solar oil and kerosene. Author

N75-32664# Defence Research Establishment Ottawa (Ontario).
ICE DRIFT IN ROBESON CHANNEL AS DETERMINED USING TELEVISION MOVING TARGET CIRCUITRY
I. H. S. Henderson and F. Paquet Mar. 1974 18 p ref
(AD-A010397; DREO-TN-74-3) Avail: NTIS CSCL 08/12

The movement of ice flows in Robeson Channel was followed over a one-week period during August 1973 using television moving-target circuitry from a cliffside base 350 m above sea level. The basis of the method was to subtract a current TV picture from a video tape recording of the same scene made some time previously, the difference imagery being displayed on a monitor. The TV camera was aimed to produce coincidence of a reference point selected near the center of the pre-recorded imagery, and the changes in azimuth and elevation recorded. From these, ice drift velocities were calculated. GRA

N75-32704# Earth Satellite Corp., Washington, D.C.
SEA-SURFACE WIND SPEED ESTIMATES FROM THE NIMBUS 5 ESMR Final Report, May 1974 - Feb. 1975
Romeo R. Sabatini Feb. 1975 62 p refs
(Contract N66856-4120-5501; WF52551713)
(AD-A010541; EPRF-TR-3-75(ESC)) Avail: NTIS CSCL 04/2

A statistical relationship is derived between sea surface winds and the brightness temperatures, T sub B, measured by the Nimbus 5 Electrically Scanning Microwave Radiometer (ESMR) in cloudless areas. The relationship is derived by using wind observations in the Mistral and the Tehuantepecer, two fall wind situations occurring in very different sea surface temperature and atmospheric water vapor environments. The Mistral, off the coast of southern France, is characterized by relatively cold sea-surface temperatures of 12 to 15C and dry atmospheres with about 1 cm. of precipitable water. The Tehuantepecer, off the Pacific coast of southern Mexico is characterized by warm sea surface temperatures of 22 to 28C, and moist atmospheres with about 3 cm. of precipitable water. The data thus provided a wide range of sea surface temperatures and atmospheric water content for deriving an equation relating wind and T sub B. The derived equation expresses the surface winds in terms of T sub B, sea surface temperature, and atmospheric water content, and fits the data with a probable error of 5.1 knots. The equation is used to estimate winds over the western Atlantic during an outbreak of polar air which produced strong winds. GRA

N75-32712# Stanford Univ., Calif. Radioscience Lab.
IN-SITU DECAMETRIC RADAR OBSERVATIONS OF OCEAN-WAVE DIRECTIONAL SPECTRA DURING THE 1974 NORPAX POLE EXPERIMENT Final Report, 1 Dec. 1973 - 30 Nov. 1974
Calvin C. Teague Mar. 1975 43 p refs Sponsored in part by NSF
(Contract N00014-67-A-0112-0080)
(AD-A009434; SU-SEL-75-003; TR-3615-2) Avail: NTIS CSCL 08/3

Multi-frequency decametric surface-wave radar observations of ocean-wave backscatter from the R. V. Thomas Washington during the 1974 NORPAX Pole experiment are described. The equipment installation, experimental techniques, and data processing are discussed. Both stationary and synthetic aperture observations were made. All of the data were obtained under low-wind conditions, usually less than 10 m/s. Stationary observations indicated a moderate amount of first-order line broadening, with the second-order continuum typically 20-30 db below the first-order peak. Multi-wavelength synthetic aperture directional ocean-wave spectra were quite broad, typically 120-180 degrees at the half-power points, with front-to-back ratios of no more than 15 db. GRA

N75-33447*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TESTS AND COMPARISONS OF SATELLITE DERIVED GEOIDS WITH SKYLAB ALTIMETER DATA
J. G. Marsh (Natl. Ocean Survey, Rockville, Md.), B. C. Douglas, S. Vincent (Wolf Res. and Develop. Corp., Riverdale, Md.), and D. M. Walls (Wolf Res. and Develop. Corp., Riverdale, Md.) Jul. 1975 25 p refs Presented at the Ann. Meeting of the Am.

Geophysical Union, Washington, D. C., 16-20 Jun. 1975 Submitted for publication
(NASA-TM-X-70985; X-921-75-176) Avail: NTIS HC $3.25 CSCL 08E

The SKYLAB-193 radar altimeter was operated nearly continuously around the world on January 31, 1974. This direct measurement of the sea surface topography provided an independent basis for the evaluation of global geoids computed from satellite derived gravity models. The differences between the altimeter geoid and the satellite geoids were as large as 25 meters with rms values ranging from 8 to 10 meters. These differences also indicated a systematic long wavelength variation (approximately 100 deg) not related to error in the SKYLAB orbits. Truncation of the models to degree and order eight did not eliminate the long wavelength variation, but in every case the rms agreement between satellite and altimeter geoids was improved. Orbits computed with the truncated models were in contrast found to be inferior to those computed using the complete models. Author

N75-33453*# National Oceanic and Atmospheric Administration, Miami, Fla. Environmental Research Labs.
REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Report, Jun. 1975
George A. Maul, Principal Investigator Jun. 1975 2 p EREP (Contract NASA Order T-4713-B)
(E75-10398; NASA-CR-143391; Rept-24) Avail: NTIS HC $3.25 CSCL 08C

N75-33454*# National Oceanic and Atmospheric Administration, Miami, Fla. Environmental Research Labs.
REMOTE SENSING OF OCEAN CURRENT BOUNDARY Monthly Report, Jul. 1975
George A. Maul, Principal Investigator Jul. 1975 2 p EREP (Contract NASA Order T-4713-B)
(E75-10399; NASA-CR-143392; Rept-25) HC $3.25 CSCL 08C

N75-33455*# National Oceanic and Atmospheric Administration, Miami, Fla. Environmental Research Labs.
REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Report, Aug. 1975
George A. Maul, Principal Investigator Aug. 1975 2 p EREP (Contract NASA Order T-4713-B)
(E75-10400; NASA-CR-143393; Rept-26) Avail: NTIS HC $3.25 CSCL 08C

N75-33467*# Army Engineer District, San Francisco, Calif.
[REMOTE SENSING OF SAN PABLO BAY AND SANTA BARBARA CHANNEL ISLANDS] Progress Report, 1 Jun. - 31 Aug. 1975
Douglas M. Pirie and David D. Steller, Principal Investigators (ESCA-Tech Corp., Long Beach, Calif.) 5 Sep. 1975 2 p ERTS
(NASA Order S-54062-A)
(E75-10412; NASA-CR-143405) Avail: NTIS HC $3.25 CSCL 08B

N75-33481*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GREAT LAKES ALL-WEATHER ICE INFORMATION SYSTEM
R. J. Schertler, R. A. Mueller, R. J. Jirberg, D. W. Cooper, J. E. Heighway, A. D. Holmes, R. T. Gedney, and H. Mark 1975 30 p refs Presented at 10th Intern. Symp. on Remote Sensing of the Environment, Ann Arbor, Mich., 6-10 Oct. 1975
(NASA-TM-X-71815) Avail: NTIS HC $3.75 CSCL 08L

A system is described which utilizes an X-band Side-Looking-Airborne-Radar (SLAR) for determining type, location, and aerial distribution of the ice cover in the Great Lakes and an airborne, S-band, short pulse radar for obtaining ice thickness. The SLAR system is currently mounted aboard a U.S. Coast Guard C-130B aircraft. Digitized SLAR data are relayed in real-time via the NOAA-GOES-1 satellite in geosynchronous orbit to the U.S. Coast Guard Ice Center in Cleveland, Ohio. SLAR images along with hand-drawn interpretative ice charts for various winter shipping areas in the Great Lakes are broadcast to facsimile recorders aboard Great Lakes vessels. The operational aspects of this ice information system are being demonstrated by NASA, U.S. Coast Guard, and NOAA/National Weather Service. Results from the 1974-75 winter season demonstrated the ability of this system to provide all-weather ice information to shippers in a timely manner. Author

N75-33482*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
REMOTE PROFILING OF LAKE ICE USING AN S-BAND SHORT PULSE RADAR ABOARD AN ALL-TERRAIN VEHICLE
Dale W. Cooper, Robert A. Mueller, and Ronald J. Schertler 1975 19 p refs Presented at Subsurface Probing Session of the International Union of Radio Science Meeting, Boulder, Colorado, 20-23 Oct. 1975
(NASA-TM-X-71808; E-8502) Avail: NTIS HC $3.25 CSCL 08L

An airborne short-pulse radar system to measure ice thickness was designed. The system supported an effort to develop an all-weather Great Lakes Ice Information System to aid in extending the winter navigation season. Experimental studies into the accuracy and limitations of the system are described. A low power version was operated from an all-terrain vehicle on the Straits of Mackinac during March 1975. The vehicle allowed rapid surveying of large areas and eliminated the ambiguity in location between the radar system and the ground truth ice auger team. It was also possible to the effects of snow cover, surface melt water, pressure ridging, and ice type upon the accuracy of the system. Over 25 sites were explored which had ice thicknesses from 29 to 60 cm. The maximum radar overestimate was 9.8 percent, while the maximum underestimate was 6.6 percent. The average error of the 25 measurements was 0.1 percent. Author

N75-33488# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
USE OF SIDE LOOKING AIRBORNE RADAR TO DETERMINE LAKE DEPTH ON THE ALASKAN NORTH SLOPE
P. Sellmann, W. F. Weeks, and W. J. Campbell May 1975 14 p refs
(AD-A011249; CRREL-SR-230) Avail: NTIS CSCL 08/12

Side-looking airborne radar (SLAR) imagery obtained in April-May 1974 from the North Slope of Alaska between Barrow and Harrison Bay indicates that tundra lakes can be separated into two classes based on the strength of the radar returns. Correlations between the areal patterns of the returns, limited ground observations on lake depths, and information obtained from ERTS imagery strongly suggest that freshwater lakes giving weak returns are frozen completely to the bottom while lakes giving strong returns are not. Brackish lakes also give weak returns even when they are not completely frozen. This is presumably the result of the brine present in the lower portion of the ice cover limiting the penetration of the X-band radiation into the ice. Although the physical cause of the differences in radar backscatter has not been identified, several possibilities are discussed. The ability to rapidly and easily separate the tundra lakes into these two classes via SLAR should be useful in a wide variety of different problems. GRA

N75-33490# Defence Research Establishment Ottawa (Ontario). Earth Sciences Div.

SOME SEA ICE OBSERVATIONS AT HERSCHEL ISLAND IN MID WINTER 1973

Gerald J. Irwin Jul. 1974 23 p refs

(AD-A010498; DREO-TN-74-16) Avail: NTIS CSCL 08/12

Some observations of sea ice near the shoreline were made during a week's visit to Herschel Island, N.W.T. in January and February 1973. The observations of leads, hummocks, tidal cracks and ice strains constitute the author's initial acquaintance with ice conditions above the arctic circle. Apparent expansions and contractions in the level ice sheet of Thetis Bay give positive and negative values of strain averaging 0.00017. The latter phenomenon may correspond to relative decreases and increases in air temperature from day to day. GRA

N75-33625# Royal Aircraft Establishment, Farnborough (England).

SEA WAVE SPECTRA DERIVED FROM AIRBORNE RADIO ALTIMETER MEASUREMENTS

A. C. Machin 10 Dec. 1974 29 p ref

(RAE-TM-GW-1001; BR44879) Avail: NTIS HC $3.75

The results of a preliminary investigation into the accuracy of sea wave spectra derived from measurements of the sea wave encounter spectrum, are presented. The basic measurements require an aircraft equipped with a radio altimeter and tape recorder with some available means of calculating the motions of the aircraft in a vertical plane. The predicted spectra are compared with those derived from wave measurements using a datawell waverider buoy. A FORTRAN program to carry out the processing of results is included. Author (ESA)

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06

HYDROLOGY AND WATER MANAGEMENT

Includes snow cover and water runoff in rivers and glaciers, saline intrusion, drainage analysis, geomorphology of river basins, land uses, and estuarine studies.

A75-40619 * ***A sensitivity analysis of regional and small watershed hydrologic models.*** R. Ambaruch, V. V. Salomonson (NASA, Goddard Space Flight Center, Hydrology and Oceanography Branch, Greenbelt, Md.), and J. W. Simmons (IBM Corp., Federal Systems Div., Huntsville, Ala.). In: Technology today for tomorrow; Proceedings of the Twelfth Space Congress, Cocoa Beach, Fla., April 9-11, 1975. Cocoa Beach, Fla., Canaveral Council of Technical Societies, 1975, p. 5-37 to 5-47. 6 refs. Contract No. NAS5-21942.

Continuous simulation models of the hydrologic behavior of watersheds are important tools in several practical applications such as hydroelectric power planning, navigation, and flood control. Several recent studies have addressed the feasibility of using remote earth observations as sources of input data for hydrologic models. The objective of the study reported here was to determine how accurately remotely sensed measurements must be to provide inputs to hydrologic models of watersheds, within the tolerances needed for acceptably accurate synthesis of streamflow by the models. The study objective was achieved by performing a series of sensitivity analyses using continuous simulation models of three watersheds. The sensitivity analysis showed quantitatively how variations in each of 46 model inputs and parameters affect simulation accuracy with respect to five different performance indices. (Author)

A75-41445 **Skylab data and water resources management.** F. C. Polcyn and T. W. Wagner (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: Skylab science experiments; Proceedings of the Symposium, San Francisco, Calif., February 28, 1974. Tarzana, Calif., American Astronautical Society, 1975, p. 187-205.

Skylab multispectral photography (S190A) and terrain-mapping photography (S190B) obtained from the Lake Ontario Basin illustrate surface conditions which determine basin water-storage and effect rates of runoff and evaporation. Multispectral scanner data (S192) are expected to provide quantitative information concerning these same elements. Several examples of processed ERTS multispectral scanner data help to illustrate these types of information. Examples of Skylab imagery from other areas of the U.S. further demonstrate the value of these data in the study and management of our vital fresh water resources. (Author)

N75-28480 Wisconsin Univ., Madison.
APPLICATION OF REMOTE SENSING TO THE LOCATION OF HYDROLOGICALLY ACTIVE (SOURCE) AREAS Ph.D. Thesis
Achi Mohamed Ishaq 1974 241 p
Avail: Univ. Microfilms, Order No. 75-9979

Surface and subsurface runoff, geographically concentrated at hydrologically active portions of a basin was studied. Two simultaneous processes which together produce storm runoff were considered: (1) a perennial channel system which expands and extends into zones of low storage capacity and directly intercepts precipitation which is rapidly incorporated into stream-flow. (2) The expanding channel system fed by subsurface flow, which enters at a slower rate than direct runoff, but may be responsible for the bulk of storm flow in some watersheds. Field studies were established at the water source areas determined from remote sensing analysis to investigate depth variation of soil moisture with time. Streamflow and precipitation monitoring sites were established. A method for identifying water source areas was established from the analysis of color infrared imagery. Results of statistical analysis of soil moisture and other data reveal that soil moisture in source areas is higher than in nonsource areas. Dissert. Abstr.

N75-28488*# Geological Survey, Reston, Va.
DRAINAGE BASIN CHARACTERISTICS FROM ERTS DATA Progress Report, 1 Jul. - 31 Dec. 1974
Este F. Hollyday, Principal Investigator 1 Jan. 1975 10 p ERTS
(NASA Order S-70243-AG)
(E75-10350; NASA-CR-143152) Avail: NTIS HC $3.25 CSCL 08H

The author has identified the following significant results. ERTS-derived measurements of forests, riparian vegetation, open water, and combined agricultural and urban land use were added to an available matrix of map-derived basin characteristics. The matrix of basin characteristics was correlated with 40 stream flow characteristics by multiple regression techniques. Fifteen out of the 40 equations were improved. If the technique can be transferred to other physiographic regions in the nation, the opportunity exists for a potential annual savings in operations of about $250,000.

N75-28489*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
AN ERTS-1 INVESTIGATION FOR LAKE ONTARIO AND ITS BASIN Final Report, 31 Jul. 1972 - 31 Jul. 1974
Fabian C. Polcyn, Allen Falconer, Principal Investigators, Thomas W. Wagner, and Diana L. Rebel Jul. 1975 96 p refs Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21783)
(E75-10351; NASA-CR-143153; ERIM-19330-65-F) Avail: NTIS HC $4.75 CSCL 08H

The author has identified the following significant results. Methods of manual, semi-automatic, and automatic (computer) data processing were evaluated, as were the requirements for spatial physiographic and limnological information. The coupling of specially processed ERTS data with simulation models of the watershed precipitation/runoff process provides potential for water resources management. Optimal and full use of the data requires a mix of data processing and analysis techniques, including single band editing, two band ratios, and multiband combinations. A combination of maximum likelihood ratio and near-IR/red band ratio processing was found to be particularly useful.

N75-28512# Little (Arthur D.), Inc., Cambridge, Mass.
RESEARCH ON WATER RESOURCES EVALUATION METHODOLOGY: A RIVER BASIN ECONOMIC AND FINANCIAL POST-AUDIT Final Report
John M. Wilkinson 31 Mar. 1975 203 p refs
(Contract DI-14-31-0001-4228)
(PB-241061/1; W75-06524; OWRT-C-5126(4228)(1)) Avail: NTIS HC $7.25 CSCL 13/3

This postaudit of the Pick-Sloan Missouri Basin Program attempted to quantify the 30-year performance of multipurpose programs in dollar terms. Applying current evaluation principles and standards of the Water Resources Council on an ex-post basis, the objective was to determine how much physical and dollar realities have differed from original plans, why they have differed, and what are the implications for future planning. It appears that flood control and electric power program performance far exceeded plan, while that for irrigation and navigation programs fell far short of plan. Benefits could be double or half most of those estimated in this post-audit, depending on value assumptions. GRA

N75-29520*# Corps of Engineers, Waltham, Mass.
THE USE OF LANDSAT DCS AND IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION Progress Report, 1 Jun. 1975
Saul Cooper, Principal Investigator 1 Jun. 1975 58 p refs Sponsored by NASA Original contains color illustrations ERTS

(E75-10378; NASA-CR-143240; PR-1) Avail: NTIS HC $4.25 CSCL 08H

N75-30679# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
INUNDATION DAMAGE TO VEGETATION AT SELECTED NEW ENGLAND FLOOD CONTROL RESERVOIRS
Harlan L. McKim, Lawrence W. Gatto, and Carolyn J. Merry Mar. 1975 49 p refs Prepared in cooperation withs Corps of Engr., Waltham, Mass.
(AD-A009075; CRREL-SR-220) Avail: NTIS CSCL 13/2

The effect on vegetation of inundation caused by the regulation and impoundment of water at six New England flood control reservoirs during the June-July 1973 flood was assessed from color infrared photography and corroborative ground surveys. A large amount of reservoir storage was utilized during the two-week inundation period, resulting in extensive damage to vegetation. Four degrees of apparent vegetative damage were differentiated from color infrared photography based on color differences ranging from bright red on magenta for healthy foliage to cyan for unhealthy, damaged or dying vegetation. Correlative ground truth data showed that the deciduous trees, particularly silver maple and red oak, were least affected and that coniferous trees, especially white pine, were most affected by siltation and inundation. Much of the understory vegetation, i.e. poplar, basswood and hornbeam, lost all leaves after inundation but new buds and shoots reappeared by late September 1973. Generally, trees inundated for less than 90 hours were not extensively damaged. GRA

N75-31561# National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.
A GUIDE TO METHODS AND STANDARDS FOR THE MEASUREMENT OF WATER FLOW Final Report
Gershon Kulin and Philip R. Compton May 1975 100 p refs (COM-75-10683/1; NBS-SP-421; LC-75-11527) Avail: NTIS MF $2.25; SOD HC as C13.10:421 CSCL 13B

Selected information sources on methods and standards for making measurements of water and wastewater flow in the field are listed and described. Both closed conduit and free surface flows are treated, but emphasis is on open channel flow measurements needed in water resource engineering and in water pollution control. Instruments and methods covered include weirs, flumes, current meters (and velocity traverse methods), dilution techniques, pipe flow instruments, acoustic meters, and others. In addition to summarizing the basic properties of each instrument or method and referring users to the best available sources of detailed information on performance and field application, potential sources of error are described and quantified where possible. GRA

N75-32518 Joint Publications Research Service, Arlington, Va.
RESULTS OF THE INTERNATIONAL HYDROLOGIC DECADE
A. A. Sokolov *In its* Meteorology and Hydrol., No. 6, 1975 (JPRS-65607) 4 Sep. 1975 p 1-10 refs Transl. into ENGLISH from Meteorol. Gidrolog. (Moscow), no. 6, 1975 p 3-10

Progress in the study of water resources, the improvement of methods of research, calculation and forecasting of the water regime elements and the water budget, and the contribution of Soviet scientists to the execution of the International Hydrologic Decade (IHD) program are investigated. It is noted that at the end of the IHD, the General Conference of UNESCO in November 1974 adopted a new, unlimited program for international cooperation in hydrology which is called the International Hydrologic Program (IHP), and the plan for the execution of the first phase of this program in 1975-1980 was approved. Author

N75-33457*# Oslo Univ. (Norway).
HYDROLOGICAL INVESTIGATIONS IN NORWAY Quarterly Report
Johnny Skorve, Principal Investigator 28 Aug. 1975 2 p Sponsored by NASA ERTS
(E75-10402; NASA-CR-143395) Avail: NTIS HC $3.25 CSCL 05B

N75-33460*# Norwegian Water Resources and Electricity Board, Oslo.
HYDROLOGICAL INVESTIGATIONS IN NORWAY Quarterly Report, 1 Apr. - Aug. 1975
Helge A. Oedegaard, Principal Investigator 1 Aug. 1975 5 p Sponsored by NASA ERTS
(E75-10405; NASA-CR-143398) Avail: NTIS HC $3.25 CSCL 05B

N75-33462*# National Oceanic and Atmospheric Administration, Washington, D.C.
EVALUATION OF LANDSAT-2 DATA FOR SELECTED HYDROLOGIC APPLICATIONS Progress Report
Donald R. Wiesnet, David F. McGinnis, Jr., Principal Investigators, and Michael C. McMillan 6 Dec. 1975 3 p ERTS
(Contract NAS5-53991A)
(E75-10407; NASA-CR-143400) Avail: NTIS HC $3.25 CSCL 08H

N75-33469*# Mississippi State Univ., Mississippi State. Inst. for Environmental Studies.
A STUDY OF THE APPLICATION OF SKYLAB EREP S-192 DATA TO LAND CLASSIFICATION IN THE MISSISSIPPI DELTA ALLUVIAL PLAINS REGION Final Report, Apr. 1973 - Sep. 1975
C. W. Bouchillon, Principal Investigator Sep. 1975 50 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13363)
(E75-10414; NASA-CR-144402) Avail: NTIS HC $3.75 CSCL 08B

N75-33475*# Bendix Corp., Ann Arbor, Mich.
APPLICATION OF LANDSAT TO THE SURVEILLANCE AND CONTROL OF LAKE EUTROPHICATION IN THE GREAT LAKES BASIN Progress Report, 11 May - 11 Aug. 1975
Robert H. Rogers, Principal Investigator Aug. 1975 45 p Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-20942)
(E75-10420; NASA-CR-143409; BSR-4191; BSR-4192) Avail: NTIS HC $3.75 CSCL 08H

The author has identified the following significant results. By use of distilled water samples in the laboratory, and very clear lakes in the field, a technique was developed where the atmosphere and surface noise effects on LANDSAT signals from water bodies can be removed. The residual signal dependent only on the material in water was used as a basis for computer categorization of lakes by type and concentration of suspended material. Several hundred lakes in the Madison and Spooner, Wisconsin area were categorized by computer techniques for tannin or nontannin waters and for the degree of algae, silt, weeds, and bottom effects present. When the lakes are categorized as having living algae or weeds, their concentration is related to the enrichment or eutrophication of the lake.

N75-33477*# Federal Geological Survey, Hanover (West Germany).
HYDROGEOLOGICAL INVESTIGATIONS IN THE PAMPA OF ARGENTINA Final Report, Dec. 1973 - Nov. 1974

Dieter Bannert, Principal Investigators, H. Bender, W. Kruck, and J. J. Lago Nov. 1974 24 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10422; NASA-CR-143410; Rept-1) Avail: NTIS HC $3.25 CSCL 08H

The author has identified the following significant results. Satellite imagery in combination with ground investigations allows identification and delineation of differences in the conditions of the near surface ground water (depth to ground water, salinity). The degree of precision achieved is greater than that obtainable by conventional ground survey methods alone.

N75-33479*# Environmental Research and Technology, Inc., Concord, Mass.
STUDY TO DEVELOP IMPROVED SPACECRAFT SNOW SURVEY METHODS USING SKYLAB/EREP DATA Final Report, Mar. 1973 - May 1975
J. C. Barnes, Principal Investigator, M. D. Smallwood, and J. L. Cogan May 1975 96 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13305)
(E75-10424; NASA-CR-144388; ERT-0412-F) Avail: NTIS HC $4.75 CSCL 08L

The author has identified the following significant results. Of the four black and white S190A camera stations, snowcover is best defined in the two visible spectral bands, due in part to their better resolution. The overall extent of the snow can be mapped more precisely, and the snow within shadow areas is better defined in the visible bands. Of the two S190A color products, the aerial color photography is the better. Because of the contrast in color between snow and snow-free terrain and the better resolution, this product is concluded to be the best overall of the six camera stations for detecting and mapping snow. Overlapping frames permit stereo viewing, which aids in distinguishing clouds from the underlying snow. Because of the greater spatial resolution of the S190B earth terrain camera, areal snow extent can be mapped in greater detail than from the S190A photographs. The snow line elevation measured from the S190A and S190B photographs is reasonable compared to the meager ground truth data available.

N75-33631# Alaska Univ., College. Inst. of Marine Science.
VARIATIONS IN THE HYDROGRAPHIC STRUCTURE OF PRINCE WILLIAM SOUND
Robin D. Muench and C. Michael Schmidt 1974 137 p refs
(Grant NOAA-04-3-158-75-1)
(COM-75-10729/2; IMS-R75-1; Sea-Grant-75-1; NOAA-75051406) Avail: NTIS HC $5.75 CSCL 08J

Prince William Sound, a complex fjord-type estuarine system located off the northern Gulf of Alaska, is one of the larger North American estuarine systems not presently influenced by metropolitan activities. The study analyzes and discusses. The physical oceanographic conditions in the Sound are analyzed and discussed, providing information which can be used in making management decisions and planning specific research in the region. Those areas which are studied include the distribution of temperature, salinity, and density; mixing processes and circulation; deep-water renewal processes; and seasonal variations in hydrographic conditions. GRA

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07

DATA PROCESSING AND DISTRIBUTION SYSTEMS

Includes film processing, computer technology, satellite and aircraft hardware, and imagery.

A75-38855 # **A user's report on ERTS-1 computer compatible tapes.** I. Daniel and J. F. R. Gower (Department of Environment, Ottawa, Canada). *Canadian Journal of Remote Sensing,* vol. 1, May 1975, p. 8, 9. Abridged.

An analysis of ERTS multispectral scanner data on computer compatible tapes (CCT's) is reported. The tapes contain the original radiance values measured by the satellites in digital form. It is pointed out that for the study of scenes of special interest a computer processing of the CCT's has important advantages over an analysis of the photographic products obtained on the basis of the data. Examples for such studies are discussed. G.R.

A75-38887 **Preliminary results of the interpretation of ERTS-1 imagery for a soil survey of the Mérida region, Spain.** F. W. Hilwig, D. Goosen (International Institute for Aerial Survey and Earth Sciences, Enschede, Netherlands), and D. Katsieris. *ITC Journal,* no. 3, 1974, p. 289-312. 11 refs.

A75-38893 **Should stereo SLAR imagery be preferred to single strip imagery for thematic mapping.** B. N. Koopmans (International Institute for Aerial Survey and Earth Sciences, Enschede, Netherlands). *ITC Journal,* no. 3, 1974, p. 424-444. 11 refs.

It is known that radar shadows on single strip imagery give the interpreter a relief impression of the terrain, that in low-relief areas the shadows in the near range are often insufficient for monoscopic interpretation, and that in high-relief areas the shadows in the far range may obscure too much terrain information. The principles of height and slope measurements are discussed for single imagery and stereo images. Drainage interpretation of stereo radar imagery and single strip imagery are compared for different terrain types. It is shown that stereo viewing of overlapping radar strips offer great advantages over monoscopic viewing and that a three-dimensional image adds an extra dimension, which allows relative altitude correlations and increases the interpretability of radar strips. The deformations in the stereo image which have not yet been eliminated are noted together with the ways of eliminating them. S.D.

A75-38897 **Evaluation of SLAR image quality and geometry in PRORADAM.** F. Leberl. *ITC Journal,* no. 4, 1974, p. 518-546.

The evaluation of the SLAR imagery of PRORADAM is described, starting with an outline of its organization, then analyzing the contract and extracting the information relevant to the evaluation. Next, the results of the control of image quality and geometry are discussed, together with the standards applied whenever there was freedom in the contract to set these standards. In the ultimate section the conclusions are summarized and recommendations formulated for the further flow of activities relevant to cartographic aspects of PRORADAM. (Author)

A75-39076 **International Instrumentation - Automation Conference, New York, N.Y., October 28-31, 1974, Proceedings. Parts 1 & 2.** Conference sponsored by the Instrument Society of America. Pittsburgh, Instrument Society of America (Advances in Instrumentation. Volume 29, pt. 1 & 2), 1974. Pt. 1, 244 p.; pt. 2, 249 p. Price of part one, members, $15; nonmembers, $20; part two, members, $15; nonmembers, $20.

Papers are presented which describe control systems for industry and advances in measurement systems for chemical, aerospace, and cryogenic applications. Some of the topics covered include environmental control of electric power systems, a batch language system for sequential control of multi-unit chemical processes, use of programmable controllers in cement plants, a utilities management system for energy conservation, the vortex shedding flowmeter in cryogenic service, and electrooptical scanner for monitoring electron beam welds, and instrumentation requirements relative to federal aircraft emission regulations.

P.T.H.

A75-39084 **Instrumentation requirements relative to federal aircraft emission regulations.** W. T. Westfield (FAA, Washington, D.C.) and G. D. Kittredge (U.S. Environmental Protection Agency, Washington, D.C.). In: International Instrumentation-Automation Conference, New York, N.Y., October 28-31, 1974, Proceedings. Part 2. Pittsburgh, Instrument Society of America, 1974, p. 632.1-632.5. 10 refs.

A description is given of the views of the Environmental Protection Agency and the Federal Aviation Administration with regard to the pollutant sampling and measurement requirements embodied in the Federal aircraft emission regulations. The pollutants which are to be measured are considered along with pollutant sampling and measurement problems characteristic of turbine exhaust. Questions regarding measurement instrumentation are discussed and attention is given to the role of government/industry information exchange. G.R.

A75-42670 # **The practical use of orbital imagery for resources survey.** L. P. White (General Technology Systems, Ltd., Hounslow, Middx., England). *(British Interplanetary Society, Symposium on European Participation in Earth Resources /Space/ Projects, University College of Science and Technology, London, England, Apr. 9, 1975.) British Interplanetary Society, Journal,* vol. 28, Sept.-Oct. 1975, p. 653-658.

Milestones of space photography are considered, taking into account the first earth terrain photographs obtained from rocket firings in the late 1940s, the imagery obtained with the aid of ERTS 1, and programs carried out by the crews of Skylab. Questions related to the availability of orbital imagery are discussed along with the specific characteristics of electronic imagery. It is pointed out that by far the greatest use of orbital earth resources imagery to date has been in experimental programs. Prospective uses of satellite imagery are examined. The main requirements for imagery for earth resources users are as high a resolution as possible and good planimetric accuracy. G.R.

A75-42671 # **The applications of Landsat 1 imagery to the Sudan Savanna Project.** C. W. Mitchell (Reading, University, Reading, Berks., England). *(British Interplanetary Society, Symposium on European Participation in Earth Resources /Space/ Projects, University College of Science and Technology, London, England, Apr. 9, 1975.) British Interplanetary Society, Journal,* vol. 28, Sept.-Oct. 1975, p. 659-672. 18 refs.

The Sudan Savanna Project was a joint FAO-Sudan Government program to develop parts of the high rainfall savanna zone of that country. The investigation described here aimed to determine the value of Landsat 1 imagery to the project by comparing thematic maps derived from its interpretation with those obtained from low level aerial photographs. Landsat imagery can be used to guide the selection of areas requiring special study, sampling, or low level aerial photography. Specifically, the imagery could most effectively substitute for conventional methods in facilitating the correction and updating of topographic maps, in geological and landscape reconnaissance, and in mapping the hydrological network. (Author)

A75-42773 **A rapid method to generate spectral theme classification of Landsat imagery.** S. Shlien and A. Smith (Canada Centre for Remote Sensing, Ottawa, Canada). *Remote Sensing of Environment*, vol. 4, no. 1, 1975, p. 67-77. 23 refs.

A new table look up scheme was designed and implemented to reduce the computation time for the classification using the maximum likelihood Gaussian decision rule. High correlation of the spectral intensities in the four multispectral scanner bands reduces the number of distinct intensity vectors in an image to the order of several thousands compared with over 16 million possible vectors. This made it feasible to store the distinct vectors together with the ground cover classification in the computer's core memory. This table look up scheme permits classification of Landsat imagery at least an order of magnitude faster than conventional methods without compromising accuracy or requiring special computer hardware. (Author)

A75-43337 # **Choice of aerial photograph scale for topographic interpretation (Vybor masshtaba aerofotos'emki dlia tselei topograficheskogo deshifrirovaniia).** O. I. Anufriev and A. N. Zhivichin. *Geodeziia i Kartografiia*, July 1975, p. 50-52. In Russian.

A75-44277 * **Radar response to vegetation. II - 8-18 GHz band.** F. T. Ulaby, T. F. Bush, and P. P. Batlivala (Kansas University Center for Research, Inc., Lawrence, Kan.). *IEEE Transactions on Antennas and Propagation*, vol. AP-23, Sept. 1975, p. 608-618. 12 refs. Contract No. NAS9-10261.

The results of experimental studies on the backscattering properties of corn, milo, soybeans, and alfalfa are presented. The measurements were made during the summer of 1973 over the 8-18 GHz frequency band. The data indicate that soil moisture estimation is best accomplished at incidence angles near nadir with lower frequencies while crop discrimination is best accomplished using two frequencies at incidence angles ranging from 30 deg to 65 deg. It is also shown that temporal plant morphology variations can cause extreme variations in the values of the scattering coefficients. These morphological changes can be caused by growth, heavy rain, and in the case of alfalfa, harvesting. (Author)

A75-44398 # **Dual Doppler radar measurements within a hail producing storm in Northeast Colorado.** R. A. Kropfli and L. J. Miller (NOAA, Wave Propagation Laboratory, Boulder, Colo.). In: Conference on Cloud Physics, Tucson, Ariz., October 21-24, 1974, Proceedings. Boston, American Meteorological Society, 1975, p. 277-282.

Many interesting features of a hail producing storm have been revealed by two Doppler radars operating in the coplane mode. A precipitation induced downdraft near the leading edge of the storm complex was seen to have an active role in the evolution of the storm, not only by impeding the inflow to the main cell and causing its decay, but also by contributing to the new growth along the leading edge of the complex that eventually became the most active and persistent cells of the day. A portion of the main updraft was observed to penetrate into a region of high reflectivity gradient. The measurements were confirmed by a second coplane scan, by a surface network of anemometers and by aircraft observations. (Author)

A75-44399 # **Cell genesis, movement and associated hailfalls of July 9, 1973.** P. J. Eccles (National Center for Atmospheric Research, Boulder, Colo.). In: Conference on Cloud Physics, Tucson, Ariz., October 21-24, 1974, Proceedings. Boston, American Meteorological Society, 1975, p. 283-286. 8 refs. NSF-sponsored research.

This paper highlights the cellular structure of the large northeast Colorado thunderstorm system of July 9, 1973. Many of these cells were observed to grow, become imbedded in the system, and then decay. Storm tracks and reflectivity-height histories, as well as finer-scale individual cell histories, reveal a complex overlapped cell structure within each storm system. A comparison of cell histories points to a particularly vigorous cell growing over a vertically pointing radar and dominating the observations. A similarity is noted between the average first echo height of the major cells and that of minor cells earlier in the day, the respective temperatures being -15 and -17 C. S.J.M.

A75-47623 * **Photomorphic mapping for land-use planning.** J. E. Nichol (Aston, University, Birmingham, England). *Photogrammetric Engineering and Remote Sensing*, vol. 41, Oct. 1975, p. 1253-1257. 8 refs. Research supported by the Boulder Area Growth Study Commission and Boulder County Department of Planning; Grant No. NGL-06-003-200; Contract No. NAS5-21880.

A comparison of different land types based on their physical and environmental characteristics is seen as a useful, if not vital, element of land-use planning decisions. The use of the photomorphic-mapping technique is described in order to delineate and compare the different land types in Boulder County, Colorado, according to their constraints and values for agricultural and urban uses. Employing high-altitude color infrared aerial photography of Boulder County at a scale of 1:100,000, photomorphic areas were delineated according to similarities in pattern, tone, and texture on the photographs. The boundaries of the areas were checked and adjusted using information from thematic maps and sampling data. Constraints on specific land uses in the county could then be described on a regional basis using the photomorphic areas as a framework. (Author)

A75-28479 **Lagrange problem in magnetohydrodynamics.** P. V. Zagorskii and Iu. P. Lun'kin (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR). *(Zhurnal Tekhnicheskoi Fiziki*, vol. 44, Aug. 1974, p. 1614-1618.) *Soviet Physics - Technical Physics*, vol. 19, Feb. 1975, p. 1009-1011. 14 refs. Translation.

N75-28482*# Battelle Columbus Labs., Ohio.
CALIBRATION AND EVALUATION OF SKYLAB ALTIMETRY FOR GEODETIC DETERMINATION OF THE GEOID Progress Report, 1 Jun. - 30 Jun. 1975
A. George Mourad, Principal Investigator, S. Gopalapillai, M. Kuhner, and D. M. Fubara 14 Jul. 1975 27 p refs EREP (Contract NAS9-13276)
(E75-10344; NASA-CR-143146; PR-24) Avail: NTIS HC $3.75 CSCL 05B

The author has identified the following significant results. The Skylab altimeter experiment has proven the capability of the altimeter for measurement of sea surface topography. The geometric determination of the geoid/mean sea level from satellite altimetry is a new approach having significant applications in many disciplines including geodesy and oceanography. A generalized least squares collocation technique was developed for determination of the geoid from altimetry data. The technique solves for the altimetry geoid and determines one bias term for the combined effect of sea state, orbit, tides, geoid, and instrument error using sparse ground truth data. The influence of errors in orbit and a priori geoid values are discussed. Although the Skylab altimeter instrument accuracy is about plus or minus 1m, significant results were obtained in identification of large

N75-28483*# Corps of Engineers, San Francisco, Calif.
[LANDSAT-2 IMAGERY FOR ENHANCING COASTAL PROCESSES] Progress Report, 1 Apr. - 31 May 1975
Douglas M. Pirie and David P. Steller, Principal Investigators (Calista Corp., Long Beach, Calif.) 2 Jun. 1975 2 p Sponsored by NASA ERTS
(E75-10345; NASA-CR-143147) Avail: NTIS HC $3.25 CSCL 05B

geoidal features such as over the Puerto Rico trench. Comparison of the results of several passes shows that good agreement exists between the general slopes of the altimeter geoid and the ground truth, and that the altimerer appears to be capable of providing more details than are now available with best known geoids.

N75-28490*# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia). Dept. of Minerals and Energy.
A MULTIDISCIPLINARY STUDY OF EARTH RESOURCES IMAGERY OF AUSTRALIA, ANTARCTICA AND PAPUA, NEW GUINEA Final Report
N. H. Fisher, Principal Investigator Mar. 1975 31 p Sponsored by NASA ERTS
(E75-10352; NASA-CR-143154) Avail: NTIS HC $3.75 CSCL 05B

The author has identified the following significant results. A thirteen category recognition map was prepared, showing forest, water, grassland, and exposed rock types. Preliminary assessment of classification accuracies showed that water, forest, meadow, and Niobrara shale were the most accurately mapped classes. *Unsatisfactory results, were obtained in an attempt to discrimate* sparse forest cover over different substrates. As base elevation varied from 7,000 to 13,000 ft, with an atmospheric visibility of 48 km, no changes in water and forest recognition were observed. Granodiorite recognition accuracy decreased monotonically as base elevation increased, even though the training set location was at 10,000 ft elevation. For snow varying in base elevation from 9400 to 8420 ft, recognition decreases from 99% at the 9400 ft training set elevation to 88% at 8420 ft. Calculations of expected radiance at the ERTS sensor from snow reflectance measured at the site and from Turner model calculations of irradiance, transmission and path radiance, reveal that snow signals should not be clipped, assuming that calculations *and ERTS calibration constants were correct.*

N75-28493*# Environmental Research Inst. of Michigan, Ann Arbor. Information Systems and Analysis.
DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, Jun. 1975
Richard F. Nalepka, William A. Malila, Principal Investigators, and James P. Morgenstern 15 Jul. 1975 11 p refs EREP (Contract NAS9-13280)
(E75-10355; NASA-CR-143157; ERIM-101900-59-L) Avail: NTIS HC $3.25 CSCL 05B

N75-28506# Bureau of Mines, Denver, Colo. Mining Research Center.
FRACTAN: A COMPUTER CODE FOR ANALYSIS OF CLUSTERS DEFINED ON THE UNIT HEMISPHERE Information Circular
R. J. Shanley and M. A. Mahtab Feb. 1975 54 p refs
(PB-240685/8; BM-IC-8671) Avail: NTIS HC $4.25 CSCL 08I

A computer code is presented that was developed for isolating naturally occurring clusters of data plotted on the unit hemisphere and testing these clusters against a probability distribution which admits elliptical symmetry about its mean. A list of the computer code is provided along with an example output illustrating the delineation and analysis of clusters in fracture orientations measured in a porphyry copper deposit.
GRA

N75-28509# Maryland Univ., College Park. Computer Science Center.
COMPUTER METHODS FOR CREATING PHOTOMOSIACS
David L. Milgram Jul. 1974 24 p refs
(Contract F44620-72-C-0062)
(AD-A005693; TR-313; AFOSR-75-0198TR) Avail: NTIS CSCL 08/2

A method is presented that makes it possible to put pictures together into photomosaics that have no visible seams between the pictures.
GRA

N75-29509*# Alaska Univ., Fairbanks.
USE OF LANDSAT IMAGERY FOR WILDLIFE HABITAT MAPPING IN NORTHEAST AND EAST CENTRAL ALASKA Progress Report
Peter C. Lent, Principal Investigator and Arthur J. LaPerriere 1 Aug. 1975 4 p ERTS
(Contract NAS5-20915)
(E75-10367; NASA-CR-143225) Avail: NTIS HC $3.25 CSCL 06C

N75-29521*# California Earth Science Corp., Santa Monica.
FAULTS ON SKYLAB IMAGERY OF THE SALTON TROUGH AREA, SOUTHERN CALIFORNIA
P. M. Merifield and D. L. Lamar, Principal Investigators Jun. 1975 25 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS2-7698)
(E75-10379; NASA-CR-141918; TR-75-1) Avail: NTIS HC $3.25 CSCL 08G

The author has identified the following significant results. Large segments of the major high angle faults in the Salton Trough area are readily identifiable in Skylab images. Along active faults, distinctive topographic features such as scarps and offset drainage, and vegetation differences due to ground water blockage in alluvium are visible. Other fault-controlled features along inactive as well as active faults visible in Skylab photography include straight mountain fronts, linear valleys, and lithologic differences producing contrasting tone, color or texture. A northwestern extension of a fault in the San Andreas set, is postulated by the regional alignment of possible fault-controlled features. The suspected fault is covered by Holocene deposits, principally windblown sand. A northwest trending tonal change in cultivated fields across Mexicali Valley is visible on Skylab photos. Surface evidence for faulting was not observed; however, the linear may be caused by differences in soil conditions along an extension of a segment of the San Jacinto fault zone. No evidence of faulting could be found along linears which appear as possible extensions of the Substation and Victory Pass faults, demonstrating that the interpretation of linears as faults in small scale photography must be corroborated by field investigations.

N75-29530*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
INTERPOLATION OF ERTS-1 MULTISPECTRAL SCANNER DATA
C. D. McGillem 1975 21 p
(Contract NAS9-14016; Grant NGL-15-005-112)
(NASA-CR-141861; LARS-IN-022175) Avail: NTIS HC $3.25 CSCL 05B

Three interpolation procedures, based on computing values between original sample points, for enlarging a picture are examined. An ERTS frame of Washington, D.C. was used to illustrate the results. Mathematical bases of the interpolation are given.
Author

N75-29543# Goodyear Aerospace Corp., Akron, Ohio.
***ASSOCIATIVE ARRAY PROCESSING FOR TOPOGRAPHIC* DATA REDUCTION Final Technical Report, Feb. - Nov. 1974**
R. G. Radosevic, N. J. Adams, and M. D. Diehl Nov. 1974 179 p refs
(Contract DAAK02-73-C-0336)
(AD-A006198; GER-16164; ETL-CR-74-20) Avail: NTIS CSCL 08/2

Processing of an actual map overlay (4-mil intermittent streams) on the AAP STARAN S-1000 confirmed the interim report estimate of a 2 order of magnitude improvement over the presently implemented sequential approach. Processing included line thinning, line break detection and correction, and

single and double line symbol generation. Initial efforts were made to develop AAP - raster processing system concepts, and to provide 1-mil and 2-mil resolution output data from 4-mil resolution input data. Techniques to generate additional symbology such as broken lines, railroads, area fill, and point symbols were also investigated. GRA

N75-29698# National Environmental Satellite Service, Washington, D.C.
A COMPARISON OF INFRARED IMAGERY AND VIDEO PICTURES IN THE ESTIMATION OF DAILY RAINFALL FROM SATELLITE DATA
Walton A. Follansbee and Vincent J. Oliver Jan. 1975 20 p refs
(COM-75-10435/6; NOAA-TM-NESS-62) Avail: NTIS HC $3.25 CSCL 04B

An empirical method of estimating 24-hr. rainfall in the tropics and subtropics using both satellite video pictures and infrared imagery was tested to determine whether comparable results could be obtained. This method was tested for Alabama, Georgia, and South Carolina for the months of July, August, and September 1973. The infrared data set provided approximately the same degree of accuracy as the video data set, and the mean of the estimates from the two data sets provided additional accuracy. Seven-day-running totals of observed rainfall are given. The rainfall estimation technique applies best to humid tropical convective storm areas. GRA

N75-29887*# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Systems Development Div.
BREADBOARD LINEAR ARRAY SCAN IMAGER PROGRAM
Final Report
25 Apr. 1975 150 p
(Contract NAS5-21806)
(NASA-CR-143828) Avail: NTIS HC $5.75 CSCL 20F

The performance was evaluated of large scale integration photodiode arrays in a linear array scan imaging system breadboard for application to multispectral remote sensing of the earth's resources. Objectives, approach, implementation, and test results of the program are presented. Author

N75-30515*# ESL, Inc., Sunnyvale, Calif.
A PROCEDURE FOR STANDARDIZATION OF COLOR INFRARED FILM RESPONSE
Richard L. LaPado and Robert E. Ekstrand Washington NASA Aug. 1973 18 p refs
(Contract NAS2-7064)
(NASA-CR-2575) Avail: NTIS HC $3.25 CSCL 14E

Various problems with color infrared film used for remote sensing applications which relate to the instability or variability of the relative sensitivities of the dye layers within the film and the resultant variations in color balance are indicated. A procedure developed and utilized to optimize film response and to achieve more consistent results is described. The procedure establishes a sensitometric aim point with which all new batches of film are compared. Through the use of color compensation filters and change in basic exposure, the new film is exposed to produce imagery with the response characteristics of the aim curves. Author

N75-30629*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MONTEREY BAY STUDY
Robert M. Bizzell and Lewis C. Wade Washington 1975 33 p ref Original contains color illustrations
(NASA-SP-359; LC-74-600138) Avail: NTIS MF $2.25; SOD HC $1.45 CSCL 08J

The multispectral scanner capabilities of LANDSAT 1 were tested over California's Monterey Bay area and portions of the San Joaquin Valley. Using both computer aided and image interpretive processing techniques, the LANDSAT 1 data were analyzed to determine their potential application in terms of land use and agriculture. Utilizing LANDSAT 1 data, analysts were able to provide the identifications and areal extent of the individual land use categories ranging from very general to highly specific levels (e.g., from agricultural lands to specific field crop types and even the different stages of growth). It is shown that the LANDSAT system is useful in the identification of major crop species and the delineation of numerous land use categories on a global basis and that repeated surveillance would permit the monitoring of changes in seasonal growth characteristics of crops as well as the assessment of various cultivation practices with a minimum of onsite observation. The LANDSAT system is demonstrated to be useful in the planning and development of resource programs on earth. Author

N75-30630*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT: US STANDARD CATALOG NO. U-35
31 Jul. 1975 71 p
(NASA-TM-X-72459) Avail: NTIS HC $4.25 CSCL 05B

Information regarding the availability of LANDSAT imagery processed and input to the data files by the NASA Data Processing Facility in published on a monthly basis. The U.S. Standard Catalog includes imagery covering the continental United States, Alaska, and Hawaii. The Non-U.S. Standard Catalog identifies all the remaining coverage. Sections 1 and 2 describe the contents and format for the catalogs and the associated microfilm. Section 3 provides a cross-reference defining the beginning and ending dates for LANDSAT cycles. Author

N75-30631*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT NON-US STANDARD CATALOG NO. N-35
31 Jul. 1975 137 p
(NASA-TM-X-72458) Avail: NTIS HC $5.75 CSCL 05B

Information regarding the availability of LANDSAT imagery processed and input to the data files by the NASA Data Processing Facility is published on a monthly basis. The U.S. Standard Catalog includes imagery covering the continental United States, Alaska, and Hawaii. The Non-U.S. Standard Catalog identifies all the remaining coverage. Sections 1 and 2 describe the contents and format for the catalogs and the associated microfilm. Section 3 provides a cross-reference defining the beginning and ending dates for LANDSAT cycles. Author

N75-30632*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
GEOMETRIC ANALYSIS AND RESTITUTION OF DIGITAL MULTISPECTRAL SCANNER DATA ARRAYS
J. R. Baker and E. M. Mikhail 1975 308 p refs
(Contract NAS9-14016; Grant NGL-15-005-112)
(NASA-CR-144398; LARS-052875; T-103914) Avail: NTIS HC $9.25 CSCL 14B

An investigation was conducted to define causes of geometric defects within digital multispectral scanner (MSS) data arrays, to analyze the resulting geometric errors, and to investigate restitution methods to correct or reduce these errors. Geometric transformation relationships for scanned data, from which collinearity equations may be derived, served as the basis of parametric methods of analysis and restitution of MSS digital data arrays. The linearization of these collinearity equations is presented. Algorithms considered for use in analysis and restitution included the MSS collinearity equations, piecewise polynomials based on linearized collinearity equations, and nonparametric algorithms. A proposed system for geometric analysis and restitution of MSS digital data arrays was used to evaluate these algorithms, utilizing actual MSS data arrays. It was shown that collinearity equations and nonparametric algorithms both yield acceptable results, but nonparametric algorithms possess definite advantages in computational efficiency. Piecewise polynomials were found to yield inferior results. Author

N75-30633*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
SPLINE FUNCTION APPROXIMATION TECHNIQUES FOR IMAGE GEOMETRIC DISTORTION REPRESENTATION
Paul E. Anuta 9 Sep. 1975 44 p refs
(Contract NAS9-14016; Grant NGL-15-005-112)
(NASA-CR-144397; LARS-103174) Avail: NTIS HC $3.75 CSCL 08B

Least squares approximation techniques were developed for use in computer aided correction of spatial image distortions for registration of multitemporal remote sensor imagery. Polynomials were first used to define image distortion over the entire two dimensional image space. Spline functions were then investigated to determine if the combination of lower order polynomials could approximate a higher order distortion with less computational difficulty. Algorithms for generating approximating functions were developed and applied to the description of image distortion in aircraft multispectral scanner imagery. Other applications of the techniques were suggested for earth resources data processing areas other than geometric distortion representation. D.M.L.

N75-30702*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
QUANTIFICATION OF GEOLOGIC LINEAMENTS BY MANUAL AND MACHINE PROCESSING TECHNIQUES
Melvin H. Podwysocki, Johannes G. Moik (Computer Sci. Corp., Silver Spring, Md.), and Walter C. Shoup (Computer Sci. Corp., Silver Spring, Md.) Jul. 1975 28 p refs Presented at NASA Earth Resources Symp., Houston, Texas, June 1975 Submitted for publication
(NASA-TM-X-70951; X-923-75-183) Avail: NTIS HC $3.75 CSCL 08G

The effect of operator variability and subjectivity in lineament mapping and methods to minimize or eliminate these problems by use of several machine preprocessing methods was studied. Mapped lineaments of a test landmass were used and the results were compared statistically. The total number of fractures mapped by the operators and their average lengths varied considerably, although comparison of lineament directions revealed some consensus. A summary map (785 linears) produced by overlaying the maps generated by the four operators shows that only 0.4 percent were recognized by all four operators, 4.7 percent by three, 17.8 percent by two, and 77 percent by one operator. Similar results were obtained in comparing these results with another independent group. This large amount of variability suggests a need for the standardization of mapping techniques, which might be accomplished by a machine aided procedure. Two methods of machine aided mapping were tested, both simulating directional filters. Author

N75-30935*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CONFIGURATION DESCRIPTION AND LOAD ANALYSIS FOR THE ATMOSPHERIC AND OCEANOGRAPHIC INFORMATION PROCESSING SYSTEM (AOIPS)
John T. Dalton Jul. 1975 41 p
(NASA-TM-X-70960; X-933-75-217) Avail: NTIS HC $3.75 CSCL 05B

A computer system for processing image data is described. It essentially consists of two minicomputer systems. System components are listed and discussed, and flow charts are shown. J.R.T.

N75-31560# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
DOPPLER TRANSLOCATION TEST PROGRAM Final Report, Oct. 1972 - Sep. 1973
Frederick M. Gloeckler, Jr., Richard R. Muniz, and Glenn W. Schmeidel Dec. 1974 111 p refs
(Contract DAAK02-71-C-0334; DA Proj. 4A6-63712-D-855)
(AD-A009772; ETL-ETR-74-5) Avail: NTIS CSCL 08/2

The report covers a program of test and evaluation of the AN/PRN-6 (XN-1) Doppler Backpack equipment for use in artillery surveying and, possibly, engineering survey work. Doppler data were obtained by the U.S. Army, U.S. Navy, and the U.S. Coast Guard simultaneously to determine the effectiveness of the various parameters in various modes of operation. The Doppler equipment uses the Navy Navigation Satellite System's radio transmissions of the satellite ephemeris along with the Doppler-shift in carrier frequency to determine the geographical coordinates of the Doppler receiving equipment with the aid of a computer. The Backpack equipment, in particular, is designed for the translocation mode where two or more Backpacks receive simultaneously from a satellite, thereby enabling the determination of the one Backpack position with respect to the other. It was concluded from the test that significant improvement in accuracy could be achieved by incorporating time recovery error correction even without ionospheric refraction correction for distances up to 100 km. It was further concluded that an accuracy of 5 meters rms or better is possible with time recovery correction along with 3-dimensional computational software using 2 to 3 satellite passes. GRA

N75-31692# Naval Postgraduate School, Monterey, Calif.
TEST AND EVALUATION OF A VTPR RETRIEVAL SYSTEM FROM CLEAR-COLUMN NOAA 2 RADIANCES M.S. Thesis
Harry Milton Dyck, Jr. Mar. 1975 22 p refs
(AD-A009921) Avail: NTIS CSCL 04/2

An iterative technique for the retrieval of temperatures at each of 100 levels ranging from 1000 mb to 0.01 mb is evaluated. Clear-column radiance data in the carbon dioxide channels of the Vertical Temperature Profile Radiometer (VTPR) of NOAA 2 are used in inverting the radiative transfer equations to deduce the T(P) profile. The retrieval technique includes the computation of atmospheric transmittances due to three atmospheric absorber masses (carbon dioxide, water vapor, and ozone) and non-homogeneous temperature-pressure effects along the vertical. The program also corrects these transmittances for zenith path differences between the satellite and the retrieval site when the site is not directly below the sensor. GRA

N75-32573*# Texas A&M Univ., College Station. Dept. of Mathematics.
IMAGE 100 PROCEDURES MANUAL DEVELOPMENT: APPLICATIONS SYSTEM LIBRARY DEFINITION AND IMAGE 100 SOFTWARE DEFINITION Final Report
L. F. Guseman, Jr. and Henry P. Decell, Jr. 1975 256 p refs Prepared in cooperation with Houston Univ., Texas
(Contracts NAS9-14556; NAS9-14557)
(NASA-CR-144442) Avail: NTIS HC $8.50 CSCL 05B

An outline for an Image 100 procedures manual for Earth Resources Program image analysis was developed which sets forth guidelines that provide a basis for the preparation and updating of an Image 100 Procedures Manual. The scope of the outline was limited to definition of general features of a procedures manual together with special features of an interactive system. Computer programs were identified which should be implemented as part of an applications oriented library for the system. Author

N75-32668# Ohio State Univ., Columbus. Dept. of Geodetic Science.
TESSERAL HARMONIC COEFFICIENTS AND STATION COORDINATES FROM SATELLITE OBSERVATIONS BY COLLOCATION
Klaus-Peter Schwarz Dec. 1974 48 p refs
(Contract F19628-72-C-0120; AF Proj. 8607)
(AD-A009629; DGS-217; SR-22; AFCRL-TR-74-0641) Avail: NTIS CSCL 08/5

The usual formulation of the least squares collocation method requires the inversion of matrices with dimensions equal to the number of observations. Such a procedure poses difficult numerical problems when large numbers of observations are involved. It is shown in this report how this difficulty can be overcome. The size of the matrices to be inverted can be reduced to the number of unknown quantities, i.e. the amount of numerical work will be the same as for the corresponding adjustment problem. Numerical questions as the treatment of orbital parameters, the determination of the speed of convergence, the stability of different solutions, and the choice of a covariance function are discussed. The determination of tesseral harmonic coefficients from a combination of satellite and gravimetric data is treated in some detail and the results are related to previous work. GRA

N75-33448 California Univ., Berkeley.
MULTISTAGE VARIABLE PROBABILITY SAMPLING: THEORY AND USE IN ESTIMATING TIMBER RESOURCES FROM SPACE AND AIRCRAFT PHOTOGRAPHY Ph.D. Thesis

Philip Gendron Langley 1975 111 p
Avail: Univ. Microfilms Order No. 75-22538

The use of a forest resources information system containing data concerning the resource base is discussed. Multistage variable probability sampling is suggested as a technique for utilizing the data to stratify the population and to generate supplementary variables for use in sampling for specific components of the resource base. As new surveys were undertaken, portions of the resource base would be strengthened, providing better data for subsequent surveys. A guideline was developed for the optimal allocation of samples to various stages of multistage sample survey with variable probabilities. The derivation of the multistage theory and selected examples of the use of the technique, as well as the results obtained from trial timber surveys, are also included. The method appears to work well under the conditions described. Dissert. Abstr.

N75-33461*# Nebraska Univ., Lincoln. Conservation and Survey Div.
APPLICATION OF LANDSAT IMAGERY IN LAND USE INVENTORY AND CLASSIFICATION IN NEBRASKA Progress Report, 10 Jun. - 10 Sep. 1975
Marvin P. Carlson, Principal Investigator and Paul M. Seevers 10 Sep. 1975 6 p ERTS
(Contract NAS5-20814)
(E75-10406; NASA-CR-143399; Rept-2) Avail: NTIS HC $3.25 CSCL 08B

N75-33476*# Battelle Columbus Labs., Ohio.
THE APPLICATION OF SKYLAB ALTIMETRY TO MARINE GEOID DETERMINATION Final Report
A. G. Mourad, S. Gopalapillai, M. Kuhner, and D. M. Fubara, Principal Investigators Jul. 1975 94 p refs EREP
(Contract NAS9-13276)
(E75-10421; NASA-CR-144372) Avail: NTIS HC $4.75 CSCL 08E

The author had identified the following significant results. The major results can be divided broadly into two groups. One group is concerned with the effects of errors inherent in the various input data, such as the orbit emphemeris, a priori geoid etc. The other consists of the results of the actual analysis of the data from the Skylab EREP passes 4, 6, 7, and 9. Results from the first group were obtained from the analysis of some preliminary data from EREP pass 9 mode 5. The second group of results consists of a set of recovered bias terms for each of the submodes of observations and a set of nine altimetry geoid profiles corresponding to the various passes and modes. Along with each of these profiles, the a priori geoid, gravity anomaly, and the bathymetric data profiles are also presented for easy comparison.

N75-33480*# Applied Science Associates, Inc., Apex, N.C.
REDUCED BACKSCATTERING CROSS SECTION (SIGMA DEGREE) DATA FROM THE SKYLAB S-193 RADAR ALTIMETER Final Report, Sep. 1974 - Aug. 1975
G. S. Brown Oct. 1975 301 p refs
(Contract NAS6-2520)
(NASA-CR-141401) Avail: NTIS HC $9.25 CSCL 08J

Backscattering cross section per unit scattering area data, reduced from measurements made by the Skylab S-193 radar altimeter over the ocean surface are presented. Descriptions of the altimeter are given where applicable to the measurement process. Analytical solutions are obtained for the flat surface impulse response for the case of a nonsymmetrical antenna pattern. Formulations are developed for converting altimeter AGC outputs into values for the backscattering cross section. Reduced data are presented for Missions SL-2, 3 and 4 for all modes of the altimeter where sufficient calibration existed. The problem of interpreting land scatter data is also discussed. Finally, a comprehensive error analysis of the measurement is presented and worst case random and bias errors are estimated. Author

N75-33484*# Texas Univ., Dallas.
STATISTICAL THEORY AND METHODOLOGY FOR REMOTE SENSING DATA ANALYSIS WITH SPECIAL EMPHASIS ON LACIE Annual Report, 1 Jun. 1974 - 31 May 1975
Patrick L. Odell Jun. 1975 219 p refs
(Contract NAS9-13512)
(NASA-CR-144509; JSC-09703) Avail: NTIS HC $7.25 CSCL 02C

Crop proportion estimators for determining crop acreage through the use of remote sensing were evaluated. Several studies of these estimators were conducted, including an empirical comparison of the different estimators (using actual data) and an empirical study of the sensitivity (robustness) of the class of mixture estimators. The effect of missing data upon crop classification procedures is discussed in detail including a simulation of the missing data effect. The final problem addressed is that of taking yield data (bushels per acre) gathered at several yield stations and extrapolating these values over some specified large region. Computer programs developed in support of some of these activities are described. Author

N75-33485*+ National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT: US STANDARD CATALOG NO. U-32
30 Apr. 1975 110 p
(NASA-TM-X-72890) Avail: NTIS HC $5.25; EROS Data Center, Sioux Falls, S. D., 57198 HC $1.25 CSCL 05B

N75-33486*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT INVENTORY OF SURFACE-MINED AREAS USING EXTENDIBLE DIGITAL TECHNIQUES
Arthur T. Anderson, Dorothy T. Schultz (GE Co., Beltsville, Md.), and Ned Buchman Aug. 1975 23 p refs
(NASA-TM-X-70978; X-900-75-165) Avail: NTIS HC $3.25 CSCL 08I

Multispectral analysis of LANDSAT imagery provides a rapid and accurate means of identification, classification, and measurement of strip-mined surfaces in Western Maryland. Four band analysis allows distinction of a variety of strip-mine associated classes, but has limited extendibility. A method for surface area measurement of strip mines, which is both geographically and temporally extendible, was developed using band-ratioed LANDSAT reflectance data. The accuracy of area measurement by this method, averaged over three LANDSAT scenes taken between September 1972 and July 1974, is greater than 93%. Total affected acreage of large (50 hectare/120 acre) mines can be measured to within 1.0%. Author

N75-33489# Virginia Univ., Charlottesville. Dept. of Engineering Science and Systems.
MODELING AND CONTOURING IRREGULAR SURFACES SUBJECT TO CONSTRAINTS Final Report
James R. Jancaitis Jan. 1975 163 p refs
(Contract DAAK02-73-C-0213)
(AD-A010406; ESS-3325-101-75; ETL-CR-74-19) Avail: NTIS CSCL 08/2

The purpose of the work under this contract was the development of mathematical techniques and associated computer software for constraining mathematical models of topographic surfaces to agree with digitized stream, road, lake surface and boundary, and (automatically detected) peak data; so that computer generated contours extracted from these mathematical models would correctly reflect the presence of these features. This research and development effort has resulted in the following major accomplishments: The weighting function interpolation technique, WIT; interpolation and approximation theorems for WIT; sequential least squares techniques applied to control constraints; software for CONtouring via the Surface Averaging Concept, CONSAC; general purpose data editing software, GDES; analytic investigation of stream constraint; preliminary digital data analysis software, SIMCON and THREED; numerical investigation of the data compaction properties of WIT. GRA

N75-33623*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.

DEVELOPMENT OF AN AIRBORNE LASER BATHYMETER

Hongsuk Kim, H., Peter O. Cervenka (Computer Sci. Corp., Wallops Island, Va.), and Charles B. Lankford (Computer Sci. Corp., Wallops Island, Va.) Washington Oct. 1975 40 p refs
(NASA-TN-D-8079) Avail: NTIS HC $3.75 CSCL 08J

An airborne laser depth sounding system was built and taken through a complete series of field tests. Two green laser sources were tried: a pulsed neon laser at 540 nm and a frequency-doubled Nd:YAG transmitter at 532 nm. To obtain a depth resolution of better than 20 cm, the pulses had a duration of 5 to 7 nanoseconds and could be fired up to at rates of 50 pulses per second. In the receiver, the signal was detected by a photomultiplier tube connected to a 28 cm diameter Cassegrainian telescope that was aimed vertically downward. Oscilloscopic traces of the signal reflected from the sea surface and the ocean floor could either be recorded by a movie camera on 35 mm film or digitized into 500 discrete channels of information and stored on magnetic tape, from which depth information could be extracted. An aerial color movie camera recorded the geographic footprint while a boat crew of oceanographers measured depth and other relevant water parameters. About two hundred hours of flight time on the NASA C-54 airplane in the area of Chincoteague, Virginia, the Chesapeake Bay, and in Key West, Florida, have yielded information on the actual operating conditions of such a system and helped to optimize the design. One can predict the maximum depth attainable in a mission by measuring the effective attenuation coefficient in flight. This quantity is four times smaller than the usual narrow beam attenuation coefficient. Several square miles of a varied underwater landscape were also mapped.
Author

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08

INSTRUMENTATION AND SENSORS

Includes data acquisition and camera systems and remote sensors.

A75-38858 # **Airborne reconnaissance sensor management.** J. W. Patchell (Computing Devices of Canada, Ltd., Ottawa, Canada). *Canadian Journal of Remote Sensing,* vol. 1, May 1975, p. 16-18. Abridged.

Sensor management problems are related to situations in which the time lag which normally exists between data collection and data availability for the user is not acceptable. An airborne image processing system is currently being developed as a first-generation solution to the sensor management problem. This system will provide the operator with real-time imagery as well as a real-time (or near real-time) image processing capability. G.R.

A75-38891 **On quantitative image analysis and the study of terrain.** H. T. Verstappen (International Institute for Aerial Survey and Earth Sciences, Enschede, Netherlands). *ITC Journal,* no. 3, 1974, p. 395-413. 31 refs.

Three aspects of quantitative image analysis are distinguished and are discussed separately. Quantitative relief analysis is considered, with emphasis on the possibilities offered by dropped line plots obtained from an orthoprojector. Quantitative analysis based on density characteristics is demonstrated by the study of a sinkhole area using Quantimet equipment. Quantitative analysis based on directional properties is illustrated by an investigation of some terrain features using the technique of optical filtering by way of coherent (laser) light. (Author)

A75-38892 **Data compression and data reduction techniques for the visual interpretation of multispectral images.** N. J. Mulder and S. A. Hempenius (International Institute for Aerial Survey and Earth Sciences, Enschede, Netherlands). *ITC Journal,* no. 3, 1974, p. 414-423.

A75-38898 **Aerial photography, remote sensing and ecology.** I. S. Zonneveld (International Institute for Aerial Survey and Earth Sciences, Enschede, Netherlands). *ITC Journal,* no. 4, 1974, p. 553-560.

The practical value of remote sensing in general and classical aerial photography in particular is investigated and discussed. The two approaches known as causal (an attempt to derive a model from factor parameters) and final (a description of the whole, usually including classification) are examined. Remote sensing has the most value in the latter of these categories, especially in the field of vegetation science. However, emphasis is placed on caution in the adoption of new technologies when there is no clear-cut demand for them. S.J.M.

A75-39306 **Filter ozone spectrophotometer.** W. A. Matthews (Max-Planck-Institut für Aeronomie, Lindau über Northeim, West Germany), R. E. Basher, and G. J. Fraser (Canterbury, University, Christchurch, New Zealand). *(European Geophysical Society, Symposium on Trace Substances in the Atmosphere from Source to Sink, Trieste, Italy, Sept. 23, 24, 1974.) Pure and Applied Geophysics,* vol. 112, no. 6, 1974, p. 931-938. 10 refs. Research supported by the University Grants Committee, the University of Canterbury, and the New Zealand Meteorological Service.

A description of a filter ozone spectrophotometer for the automatic monitoring of total ozone is given. The important features of the filter instrument are discussed and these features are compared with those of the Dobson spectrophotometer. Results from an initial comparison with a Dobson spectrophotometer are also included. (Author)

A75-40615 * **Development of remote sensing techniques for assessment of hydrologic conditions in coal mining regions of Appalachia.** C. D. Pope (NASA, Earth Resources Office, Kennedy Space Center, Fla.), A. L. Higer (U.S. Geological Survey, Water Resources Div., Miami, Fla.), and A. E. Coker (U.S. Geological Survey, Water Resources Div., Tampa, Fla.). In: Technology today for tomorrow; Proceedings of the Twelfth Space Congress, Cocoa Beach, Fla., April 9-11, 1975. Cocoa Beach, Fla., Canaveral Council of Technical Societies, 1975, p. 5-5 to 5-10.

In December of 1974 the John F. Kennedy Space Center, NASA, and the Water Resources Division, United States Geological Survey (USGS), acquired photographic, thermal, and multispectral data over the Cumberland region of eastern Tennessee. This data was effectively used to delineate ground water sources, and surface water runoff into river systems in the Cumberlands. The data, coupled with an overview of the area from the Earth Resources Technology Satellite (ERTS), could be useful in determining hydrologic conditions in coal mining regions of the Appalachians. (Author)

A75-41199 * **Meteorological satellite accomplishments.** L. J. Allison, A. Arking, W. R. Bandeen, W. E. Shenk, and R. Wexler (NASA, Goddard Space Flight Center, Greenbelt, Md.). *Reviews of Geophysics and Space Physics,* vol. 13, July 1975, p. 737-746, 836-841. 181 refs.

Meteorological satellites include experimental satellites operated by NASA and operational satellites operated by the National Oceanic and Atmospheric Administration (NOAA). The operational system currently provides pictures of the entire globe, temperature measurements throughout the world, and wind measurements in selected parts of the Atlantic and Pacific oceans. Aspects of vertical sounding are discussed along with questions of parameter extraction technique development, macroscale phenomena, the heat budget of the earth-atmosphere system and the climate, and studies of ocean surface and hydrology. G.R.

A75-42045 **Aerial photography in the NOS coastal mapping division.** M. Keller (National Ocean Survey, Rockville, Md.). *(American Society of Photogrammetry, Annual Convention, Washington, D.C., Mar. 13, 1975.) Photogrammetric Engineering and Remote Sensing,* vol. 41, Aug. 1975, p. 1005-1011.

Photogrammetry is essentially a system of measuring and interpreting data recorded on aerial photography by electromagnetic energy of a wavelength ranging from about 0.380 to 0.920 micron. The physical characteristics of the National Ocean Survey (NOS) photography operation are described. The discussion covers film emulsions and filters employed, resolution and sharpness, aerial camera for near-vertical aerial photography, air photo mission and photo laboratory, general land mapping and shoreline delineation, photogrammetric bathymetry and circulatory surveys, aids to navigation, and mosaics and orthophotography. The photographic requirements of the photogrammetric activities involved are outlined. Judicious planning of the aerial photography mission is vital to a successful completion of the photogrammetric operation due to the fact that an aerial photography is the basic source of data for applying photogrammetry to the making of maps. S.D.

A75-42046 * **Classification of physiography from ERTS imagery.** F. T. Ulaby and J. McNaughton (University of Kansas Center for Research, Inc., Lawrence, Kan.). *Photogrammetric Engineering and Remote Sensing,* vol. 41, Aug. 1975, p. 1019-1027. 19 refs. Contract No. NAS5-21822.

The potential application of optical data processing to ERTS imagery as a means for automatic identification of large-scale ground patterns was investigated. Spatial frequency distribution and orientational information were derived from ERTS-1 imagery of Kansas for each of 80 sample areas, each 37 km in diameter. The application of classification algorithms to this data reveals that a high degree of correlation exists between the physiography of a sample area and its frequency information. Specifically, the band of frequencies between 1.1 and 2.8 cycles/km appear to contain most of the information needed in distinguishing different physiographic regions. (Author)

A75-42047 **Density slicing applied to forest type delineation.** D. Rodriguez-Bejarano (Escuela Nacional de Agricultura, Chapingo, Mexico). *Photogrammetric Engineering and Remote Sensing,* vol. 41, Aug. 1975, p. 1029-1035, 1037. 5 refs.

Differences of tone between objects are recorded as different densities by a photographic material. Density slices are the points of a photographic image (either negative or positive) which exhibit identical density. A study is performed to determine the density slices of a forested area on Agfacontour film, followed by copying these density slices on very high contrast lith film. Experimental results show that the use of density slicing in object recognition is well suited for discriminating conifers and broadleafed trees in a forested area. The advantages of this technique are that the rough delineation obtained can be used for preliminary sampling for inventory purposes, that the system is quick once the densities are determined, and that it can yield a map (color composite or lith film copies) of the area ready for observation and assessment. S.D.

A75-42665 # **Methodological questions in the digitised analysis of ERTS data.** A. C. Armstrong (East Anglia, University, Norwick, England). *(British Interplanetary Society, Symposium on European Participation in Earth Resources /Space/ Projects, University College of Science and Technology, London, England, Apr. 9, 1975.) British Interplanetary Society, Journal,* vol. 28, Sept.-Oct. 1975, p. 608-612. 12 refs. Research supported by the Natural Environment Research Council.

Methodological questions that arise when using ERTS digital data to derive 'land types' over large areas are discussed. Some of the disadvantages of per-point classifications as usually implemented are outlined, and the advantages of per-field classifications discussed. The superior performance of an unsupervised classification scheme in an exploratory situation is outlined. The advantages of an unsupervised per-field analysis are, however, gained only at the expense of greatly increased computing effort. (Author)

A75-42770 **The use of television for remote sensing.** R. D. Worsfold, J. A. Allen, and B. E. Fretts (Canada Centre for Remote Sensing, Ottawa, Canada). *Remote Sensing of Environment,* vol. 4, no. 1, 1975, p. 5-35. 21 refs.

The Canada Center for Remote Sensing has been using television since 1971 for their remote sensing programme. By adding a video tape recorder to the television camera, a system was put together that could be used to video record the actual path of the aircraft over the terrain and retain the video for comparison with the flight line map and comparison with other data recorded on the same flight. By installing television monitors at the sensor operator positions, the television system could be used for the training of the operators in the use of infrared scanners. With the installation of nonimaging sensor systems that are flown under nonphotographic conditions, it has become evident that television provides a suitable sensor system for comparing the nonimaging system data with the data that has been obtained simultaneously with the television system. The spectral sensitivity of television in the blue and green spectral regions made it extremely useful for oil spill studies. (Author)

A75-44605 **Difference detection.** S. E. Masry, W. H. Hilborn (New Brunswick, University, Fredericton, Canada), and B. G. Crawley (Gestalt International, Ltd., Vancouver, British Columbia, Canada). *Photogrammetric Engineering and Remote Sensing,* vol. 41, Sept. 1975, p. 1145-1148. 5 refs.

A method based on the blink principle is proposed for detecting differences between images. The blink principle is tested using a Hinman collator and a Gestalt photomapper. It is shown that the method is suitable for imagery such as ERTS in which the two images examined are of the same area with differences in spectral signatures. Better results can be obtained with a flexible television viewing system. The features of an instrument for difference detection in imagery and photography are presented. S.D.

A75-44606 * **Remote sensing and urban public health.** M. Rush and S. Vernon (Texas, University, Houston, Tex.). *Photogrammetric Engineering and Remote Sensing,* vol. 41, Sept. 1975, p. 1149-1155. 10 refs. Contract No. NAS9-12823.

The applicability of remote sensing in the form of aerial photography to urban public health problems is examined. Environmental characteristics are analyzed to determine if health differences among areas could be predicted from the visual expression of remote sensing data. The analysis is carried out on a socioeconomic cross-sectional sample of census block groups. Six morbidity and mortality rates are the independent variables while environmental measures from aerial photographs and from the census constitute the two independent variable sets. It is found that environmental data collected by remote sensing are as good as census data in evaluating rates of health outcomes. S.D.

A75-45182 **International Radar Conference, Arlington, Va., April 21-23, 1975, Record.** Conference sponsored by the Institute of Electrical and Electronics Engineers and Institute of Electrical Engineering. New York, Institute of Electrical and Electronics Engineers, Inc., 1975. 639 p. $35.

International radar developments for the time period from 1975 to 1985 are considered and advances related to moving target indication are examined. Radar techniques and developments in the field of signal management are discussed, taking into account the digital generation of wideband LFM waveforms, modulation waveforms for continuous wave radar, fast and efficient target search with phased array radars, certain effects of nonsinusoidal carriers in radar, and the utilization of functionally dedicated micro processors in radar video processing. Other topics considered are related to propagation and multipath, systems, antennas and microwave, tracking, targets and systems, and synthetic aperture and imaging radar. G.R.

A75-45256 **Radar data processing and exploitation facility.** D. A. Ausherman, W. D. Hall, J. N. Latta, and J. S. Zelenka (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: International Radar Conference, Arlington, Va., April 21-23, 1975, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 493-498. 8 refs.

A system is described which is dedicated to the signal processing and image exploitation aspects of synthetic aperture radar (SAR). The system utilizes coherent optical, hybrid optical-digital, and wholly digital approaches to SAR data processing. The subsystems using each one of these processing media are briefly reported. Examples of processed imagery are included and an application to radar remote sensing of the earth's surface is given as an example of one use of the facility. (Author)

A75-45257 * **Aperture size and ambiguity constraints for a synthetic aperture radar.** R. W. Bayma (Michigan, Environmental Research Institute, Ann Arbor, Mich.) and P. A. McInnes (Sheffield, University, Sheffield, England). In: International Radar Conference, Arlington, Va., April 21-23, 1975, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 499-504. Contract No. NAS2-7204.

Aperture-size and pulse-repetition frequency (PRF) constraints for a terrain-mapping synthetic-aperture radar are reviewed. Ambiguous Doppler responses are plotted as a function of PRF and normalized antenna beamwidth. A design procedure for selecting aperture size and PRF such that the ambiguous responses are below an acceptable level is presented. (Author)

A75-45258 **The ERIM simultaneous X- and L-band dual polarization radar.** R. Rawson, F. Smith, and R. Larson (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: International Radar Conference, Arlington, Va., April 21-23, 1975, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 505-510. 6 refs.

A description is given of the radar system and the holographic display of a simultaneous X-L dual polarization system. The X-L radar system is installed in a C-46 aircraft. The system weight is about 2000 lbs. The X-L radar is a dual-frequency dual-polarization side-looking airborne radar designed to image a terrain swath parallel to the aircraft flight path. A holographic recording display system was developed to prevent the loss of amplitude integrity. Inertial navigation and motion compensation requirements are also discussed. The motion compensation system for the dual-band radar uses two scale factors alternately as appropriate for the two radar wavelengths. G.R.

A75-45261 * An inexpensive side-looking radar with a novel display. L. A. Eichel, R. K. Moore, M. Weilert (University of Kansas Center for Research, Inc., Lawrence, Kan.), and F. Schlude (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Oberpfaffenhofen, West Germany). In: International Radar Conference, Arlington, Va., April 21-23, 1975, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 522-526. Grant No. NGL-17-002-001.

A moderate-performance side-looking imaging radar has been constructed at a hardware cost of about $13,000. The system produces good gray-scale rendition, has a resolution (at X-band) of 8 m/km along-track, and 12 m slant-range, and uses a novel display technique. The display is built up in a scan-converter storage tube and presented periodically on a TV monitor for observation or for photography. Systems such as this, based on use of commercially available hardware, should make possible much wider use of SLAR for a variety of remote-sensing purposes than heretofore was possible because of the high cost of existing systems. (Author)

A75-45414 Fading characteristics of panchromatic radar backscatter from selected agricultural targets. T. F. Bush and F. T. Uloby (University of Kansas Center for Research, Inc., Lawrence, Kan.). *IEEE Transactions on Geoscience Electronics,* vol. GE-13, Oct. 1975, p. 149-157. 21 refs.

An experiment was performed to determine the fading characteristics of backscattered radar signals from four agricultural targets at 9 GHz. The targets included two different row crops (corn and soybeans), a continuous canopy (alfalfa) and bare ground. After a short review of the statistics of Rayleigh fading backscatter, the data processing method and the results of the experiment are analyzed. Comparison with theory shows adequate agreement with the experimental results provided crop type, soil moisture condition and incidence angle are correctly incorporated in the target model. Because recent studies indicate that a high degree of precision is required for mapping vegetation types with radar, it is necessary to acquire as much a priori knowledge of target fading characteristics as possible. (Author)

A75-45776 * Satellite altimetry applied to marine geoid determination. C. D. Leitao and J. T. McGoogan (NASA, Wallops Flight Center, Wallops Island, Va.). *International Astronautical Federation, International Astronautical Congress, 26th, Lisbon, Portugal, Sept. 21-27, 1975, Paper 75-122.* 12 p. 8 refs.

The pioneering satellite radar altimeter aboard Skylab has provided a wealth of information about ocean surface topography for both the oceanographic and geodetic communities. This report describes typical satellite altimetry concepts and discusses the parameters measured, geometry utilized, and techniques employed to generate ocean geoid estimates. The standard deviation of the noise on the altitude measurements is shown to range from one to three meters when the altimeter antenna is nadir aligned. The altimeter is shown to sense short wavelength ocean surface features which are not included in present conventional global geoids. An estimate of a local geoid in the Atlantic, using only altimeter data, is presented. Finally, results demonstrate that the Skylab radar altimeter system capability is less than 10 meters RMS. (Author)

A75-45876 # Application of remote sensing techniques to pedological cartography (Application des techniques de télédétection à la cartographie pédologique). A. Peyronel (Institut National de la Recherche Agronomique, Montpellier, France). *International Astronautical Federation, International Astronautical Congress, 26th, Lisbon, Portugal, Sept. 21-27, 1975, Paper ST-75-10.* 15 p. In French.

Results of an aerial photographic experiment on pedological mapping are presented and analyzed. The advantages of the photographic method of numerical techniques in the field of pedology are pointed out by the study; they feature a large savings of time in the initial phases of the cartography, as well as precision and objectivity in the tracing of soil unit contours. Procedures suitable for enlarging the scale of remote sensing for soil mapping are enumerated, such as equidensitometry, maculometric classification, and image comparison. Two methodological steps are envisioned for the proposed enlarged cartographic system: an 'apprenticing' stage importance of using multichannel radar imagery for such studies is also noted. (Author)

A75-46674 Multispectral aerial photography as exploration tool. I - Concepts, techniques and instrumentation. II - An application in the Bushveld Igneous Complex, South Africa. B. Gilbertson and T. G. Longshaw (Spectral Africa /Pty./, Ltd., Randfontein, Republic of South Africa). *Remote Sensing of Environment,* vol. 4, no. 2, 1975, p. 129-163. 63 refs.

The term multispectral photography is used to mean the recording of separate black and white photographic images on different parts of the electromagnetic spectrum. The system is sensitive only to electromagnetic radiation of wavelengths within the range 350-900 mm. Multispectral photography is carried out by imaging the scene of interest through lenses onto sensitized photographic films. The theoretically correct approach of multispectral photography in geologic exploration is characterized by in situ spectral reflectance measurements, scientific selection of camera filters, quantitative photography, and interpretation using additive techniques. The concepts and methods adequate for each of these aspects are discussed in detail. Isolation of distinct regions in the reflectance spectra of natural ground objects that yield pattern recognition information about them and/or their environment is examined. Additive projection in multispectral viewers and direct additive printing onto photographic materials are described, and their relative advantages are summarized in tabular form. S.D.

A75-47407 * Scanning system tradeoffs for remote optical sensing from geosynchronous orbit. P. J. Young (Perkin-Elmer Corp., Norwalk, Conn.). *Optical Engineering,* vol. 14, July-Aug. 1975, p. 289-294. 6 refs. Contract No. NAS5-20075.

The scanning and telescope field of view requirements for making Earth Resources (ER) and Meteorological (MET) phenomena observations from a Synchronous Earth Observation Satellite (SEOS) have been defined. The equations relating spacecraft scan capability to user scan field of view requirements are given and evaluated using four different telescope fields of view. The tradeoffs between telescope field-of-view and user scan fields of view requirements are shown, and it was determined that a 0.6 degree by 1.2 degree telescope FOV is optimum for the SEOS telescope. It was shown that an internal scan as well as external scan is required to satisfy both ER and MET users. (Author)

A75-47410 * The four- and five-band multispectral scanners for Landsat. J. C. Lansing, Jr. and R. W. Cline (Hughes Aircraft Santa Barbara Research Center, Goleta, Calif.). *Optical Engineering,* vol. 14, July-Aug. 1975, p. 312-322. 6 refs. Contracts No. NAS5-11624; No. NAS5-11647; No. NAS5-11255.

The earth resources sensing Multispectral Scanner (MSS) for the Landsat satellite has two versions; one with four spectral bands from 0.5 to 1.1 microns, and one with five bands, the added band being 10.4 to 12.6 microns. This paper describes optical design and performance. The instrument uses a flat, object-space scanning

mirror of near-linear motion, with a sensitive optical position monitor to detect mirror angular position. The 22.9-cm aperture telescope images the scene on an array of fiber optics, which dissect and transmit the scene energy to photomultiplier tubes detecting in Bands 1, 2, and 3, and silicon photodiodes detecting Band 4. Band 5 energy passes the fiber optic assembly and is reimaged on a radiatively cooled mercury cadmium telluride (HgCdTe) detector. The orbiting four-band scanner is furnishing data registered to better than 50-m band-to-band and resolving 80-m repetitive pattern over a 185-km swath width from 907-km altitude. (Author)

N75-28497*# Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
IN SITU SPECTRORADIOMETRIC QUANTIFICATION OF ERTS DATA Final Report, Jul. 1972 - Jan. 1975
Edward F. Yost, Principal Investigator Feb. 1975 169 p Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21793)
(E75-10359; NASA-CR-143161; TR-21) Avail: NTIS HC $6.25 CSCL 05B

N75-28498*# National Marine Fisheries Service, Bay Saint Louis, Miss.
APPLICATION OF REMOTE SENSING FOR FISHERY RESOURCE ASSESSMENT AND MONITORING Progress Report, Jun. 1975
Kenneth J. Savastano, Principal Investigator 30 Jun. 1975 2 p EREP
(NASA Order T-8217-B)
(E75-10360; NASA-CR-143162; PR-18) Avail: NTIS HC $3.25 CSCL 08A

N75-28500*# Ecosystems International, Inc., Gambrills, Md.
IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT AND DEVELOPMENT OF WATER RESOURCES, APPENDIX Final Report, Jun. 1974 - Jun. 1975
Peter A. Castruccio, Harry L. Loats, Thomas R. Fowler, and Susan L. Frech Jun. 1975 85 p refs
(Contract NAS5-20567)
(NASA-CR-143822; ECO-75-C-3-3-App) Avail: NTIS HC $4.75 CSCL 08H
Lists are presented of water resource agencies from the Federal, state, Water Resources Research Institute, university, local, and private sectors. Information is provided on their water resource activities, computers, and models used.
Author

N75-28501*# Kansas Univ. Center for Research, Inc., Lawrence.
THE APPLICATION OF REMOTE SENSING TO RESOURCE MANAGEMENT AND ENVIRONMENTAL QUALITY PROGRAMS IN KANSAS Annual Report, 1 Apr. 1974 - 31 Mar. 1975
B. G. Barr Jul. 1975 96 p refs Original contains color illustrations
(Grant NGL-17-004-024)
(NASA-CR-143247) Avail: NTIS HC $4.75 CSCL 05B
Specific assistance to state agencies and public bodies on over 15 remote sensing projects concerned with (1) urban and regional analysis, (2) rural development, and (3) habitat management and environmental analysis is discussed. Specific problems of officials are considered and a basis for communication by demonstration is provided. In addition to data products in support of specific agency projects; consultation and training in use of satellite and aircraft imagery is provided to personnel from several state, regional, and county agencies. Effective communication and confidence is established through these efforts and users now routinely seek information and advice about the application of remote sensing technology to solution of their agency problems. Author

N75-28504# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
REMOTE SENSING OF ROCK TYPE IN THE VISIBLE AND NEAR-INFRARED
John W. Salisbury and Graham R. Hunt 27 Jan. 1975 9 p refs Presented at the Intern. Symp. on Remote Sensing of Environment (9th), Ann Arbor, 15-19 Apr. 1974
(AF Proj. 7670; AF Proj. 6813)
(AD-A005383; AFCRL-TR-75-0047) Avail: NTIS CSCL 08/7
Visible and near-infrared spectra of minerals and rocks have been measured and evaluated in terms of remote sensing applications. The authors conclude that there are some differences in the spectral behavior of different rock types in the visible and near-infrared. These differences are, however, difficult or impossible to use in a generalized remote sensing effort in which the composition of all rocks is to be mapped. Instead, this spectral region lends itself best to precise and particular applications, such as enhancing the visibility of a rock unit with a known and distinctive spectral signature, or enhancing the contrast between rock units, or between rocks and the vegetative background. GRA

N75-28505# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
APPLICATION OF REMOTE SENSORS TO ARMY FACILITY MANAGEMENT. APPENDIX B: VALIDATION OF ENVIRONMENTAL MAPS PRODUCED THROUGH AIR-PHOTO INTERPRETATION
John H. Shamburger and Harry K. Woods Jan. 1975 71 p
(DA Proj. 4A6-62707-A-890)
(AD-A005556; AEWES-TR-M-74-2) Avail: NTIS CSCL 15/5
A study was performed to validate environmental baseline factor maps of the Fort Belvoir study area, which were prepared through air-photo interpretation without the aid of any supplementary data. A field data collection program was conducted to provide data to be compared with the information derived from the analysis of the aerial photos. It was found that the air-photo interpretation was quite accurate, but that increased accuracy would result if ground truth data were available to the interpreters during the interpretation process.
GRA

N75-28511# Rome Air Development Center, Griffiss AFB, N.Y.
APPLICABILITY OF A TWO DIMENSIONAL, DIGITALLY INTEGRATING, SILICON VIDICON SYSTEM IN THE DETECTION OF NATURAL RESOURCES M.S. Thesis
Gregory B. Pavlin Jan. 1975 95 p refs
(AD-A005303; RADC-TR-74-209) Avail: NTIS
The feasibility of using a two-dimensional, digitally integrating, silicon vidicon system to differentiate terrestrial rock structure and mineralization was explored. The instrumentation was tested for its ability to: differentiate minerals; resolve detailed mineralized rock structure; enhance imagery of rock structure and/or mineralized features using computer software techniques; identify mineralogy without prior ground truth; distinguish altered from unaltered rock units associated with porphyry copper deposits; and perform as a practical geophysical tool in the field. It is concluded that the vidicon system using remote-sensing techniques is a potentially powerful geophysical tool. GRA

N75-28948 Texas A&M Univ., College Station.
ON THE DEVELOPMENT OF AN INTERACTIVE RESOURCE INFORMATION MANAGEMENT SYSTEM FOR ANALYSIS AND DISPLAY OF SPATIOTEMPORAL DATA Ph.D. Thesis
John August Schell 1974 273 p
Avail: Univ. Microfilms Order No. 75-15064
Computer programming for earth imagery from the Earth Resources Technology Satellites is presented. Formal language definitions and syntax interpretation algorithms were adapted to provide a flexible, computer information system for the maintenance of resource interpretation of imagery. These techniques were incorporated, together with image analysis functions, into an interactive resource information management and analysis system, which was augmented with a dynamic color display for image presentation. Dissert. Abstr.

N75-29388*# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
A STUDY TO ANALYZE SIX BAND MULTISPECTRAL IMAGES AND FABRICATE A FOURIER TRANSFORM DETECTOR Final Report, 21 Dec. 1973 - 21 Jun. 1975
R. G. Shackelford and J. R. Walsh, Jr. 21 Jun. 1975 87 p refs
(Contract NAS8-30534; Proj. A-1592)
(NASA-CR-120684) Avail: NTIS HC $4.75 CSCL 14B

An automatic Fourier transform diffraction pattern sampling system, used to investigate techniques for forestry classification of six band multispectral aerial photography is presented. Photographs and diagrams of the design, development and fabrication of a hybrid optical-digital Fourier transform detector are shown. The detector was designed around a concentric ring fiber optic array. This array was formed from many optical fibers which were sorted into concentric rings about a single fiber. All the fibers in each ring were collected into a bundle and terminated into a single photodetector. An optical/digital interface unit consisting of a high level multiplexer, and an analog-to-digital amplifier was also constructed and is described. Author

N75-29513*# Bethune-Cookman Coll., Daytona Beach, Fla.
REMOTE SENSING OVER NORTH MERRITT ISLAND Semiannual Report, Nov. 1974 - Apr. 1975
Premsukh Poonai, Principal Investigator Apr. 1975 15 p refs
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Grant NGR-10-022-001)
(E75-10371; NASA-CR-143229) Avail: NTIS HC $3.25 CSCL 08B

The author has identified the following significant results. For monitoring the surface environment of North Merritt Island, two methods are studied, namely, color infrared photography and machine processing of LANDSAT multispectral scanner data. C.I.R. photos made at a height of about 12,000 ft were found to define the borders of ground features around the space shuttle runway with a nonsignificant mean error of 0.138 meters but a wide range, which can be reduced with photos taken at about 6,000 ft. LANDSAT multispectral scanner data, transformed by use of the function f(g) = g1 + g2 -g3 -g4 where g1, g2, g3, and g4 represent reflectance or grey levels of multispectral channels 1,2,3, and 4, gave values which are classifiable into a relatively small number of categories.

N75-29527*# Purdue Univ., Lafayette, Ind.
THE APPLICATION OF REMOTE SENSING TECHNOLOGY TO THE SOLUTION OF PROBLEMS IN THE MANAGEMENT OF RESOURCES IN INDIANA Semiannual Status Report, 1 Dec. 1974 - 31 May 1975
D. A. Landgrebe 31 May 1975 14 p
(Grant NGL-15-005-186)
(NASA-CR-143317) Avail: NTIS HC $3.25 CSCL 08F

The use of satellite remote sensing for resources management was investigated in Indiana. The technique was applied to strip mining and reclamation, highway planning, and the detection of dolomite reefs. A data base was created and used to produce land characteristics and suitability maps for land use planning. In addition, a three dimensional model was developed which provides a cross-sectional profile of the thermal plumes emitted by point sources of thermal pollution into rivers and lakes; this model may be used for the design and site selection of electric power plants. D.M.L.

N75-29529*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
BRINGING REMOTE SENSING TECHNOLOGY TO THE USER COMMUNITY
J. C. Lindenlaub, S. M. Davis, and D. B. Morrison 1975 18 p refs *Presented at Earth Resources Survey Symp., Houston, Tex., Jun. 1975*
(Contract NAS9-14016)
(NASA-CR-141931; LARS-IN-051975; T-1039/4) Avail: NTIS HC $3.75 CSCL 05B

The procedures and services available for educating and training potential users of remote sensing technology are discussed along with approaches for achieving an in-house capability for the analysis of remotely sensed data using numerical techniques based on pattern recognition principles. Cost estimates are provided where appropriate. Author

N75-29594# National Environmental Research Center, Research Triangle Park, N.C. Chemistry and Physics Lab.
A SPECTROSCOPIC STUDY OF CALIFORNIA SMOG Final Report
Philip L. Hanst, William E. Wilson, Ronald K. Patterson, Bruce W. Gay, Jr., and Lucian W. Chaney Feb. 1975 69 p refs
(PB-241022/3; EPA-650/4-75-006; APTIC-75095) Avail: NTIS HC $4.25 CSCL 04A

Long-path infrared spectroscopy has yielded data on the composition and chemistry of the polluted air at Pasadena, California. Infrared radiation was transmitted along a 417 meter path folded between mirrors in a class tube 9 meters long. Spectra of polluted air were recorded with a Fourier transform spectrometer system and were plotted in ratio mode against the spectra of humidified reference air. This ratio plotting *allowed the observation of weak pollutant absorption lines by* removing the background spectrum of water and carbon dioxide lines. Data were taken in late November 1972 and in the summer of 1973. The chemistry of the air is discussed in terms of the observations. GRA

N75-30525*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
THE USE OF LASERS FOR HYDROGRAPHIC STUDIES
Hongsuk H. Kim, ed. and Philip T. Ryan, ed. Washington 1975 202 p refs Symp. held at Wallops Island, Va., 12 Sep. 1973 (NASA-SP-375) Avail: NTIS HC $7.25 CSCL 20E

The utilization of remote laser sensors in water pollution detection and identification, coastal environmental monitoring, and bathymetric depth sounding, is discussed.

N75-30527* National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
USE OF LIDAR SYSTEMS IN MEASURING CERTAIN PHYSICAL OCEANOGRAPHIC PARAMETERS
Davison T. Chen *In its* The Use of Lasers for Hydrographic Studies 1975 p 47-50 refs

CSCL 20E

Remote sensing techniques, such as LIDAR, are the only observation methods which are capable of fast scanning over a vast area to produce synoptic views which are necessary for time and space study of the ocean. However, due to the very nature of the way data are collected, all the information thus obtained is confined, to or in the immediate neighborhood of the surface. Nevertheless, all the physical processes in the ocean are controlled mainly by both surface and subsurface parameters; they act and interact among themselves and produce the phenomena we actually observe in time and space. Remote sensing techniques are very effective for those phenomena controlled by surface parameters which account for most of the *crucial problems in physical oceanography.* Author

N75-30528* Naval Air Development Center, Warminster, Pa.
EXPERIMENTAL RESULTS OF A CONTINUOUS WAVE LASER RADAR SYSTEM
Kenneth J. Petri and Robert F. Starry *In* NASA. Wallops Station The Use of Lasers for Hydrographic Studies 1975 p 51-66 refs
CSCL 20E

A 1.06 *micron CW laser radar system was* used to establish the feasibility of remotely measuring sea surface wind magnitude and direction. Simultaneous correlation of collected laser data with the environment was established by using meteorological instruments. The experimental system and methods of analysis

are summarized. Results of the experiments, including wind magnitude and direction correlation, are reported. Results are compared with theoretical predictions. Author

N75-30530* Sparcom, Inc., Alexandria, Va.
RECENT ADVANCES IN THE APPLICATIONS OF PULSED LASERS IN THE HYDROSPHERE
George D. Hickman *In* NASA. Wallops Station The Use of Lasers for Hydrographic Studies 1975 p 81-88 refs

CSCL 20E

Laboratory and field measurements have been performed on the transmission/scattering characteristics of a pulsed neon laser as a function of water turbidity. These results have been used to establish the criteria for an airborne laser bathymetry system. Extensive measurements have been made of laser induced fluorescence using a pulsed tunable dye laser. Feasibility has been demonstrated for remote detection and possible identification of various types of algae and oils. Similar measurements made on a wide variety of organic dyes have shown this technique to have applications in remote measurements of subsurface currents, temperature and salinity. Author

N75-30534* Toronto Univ. (Ontario).
DEVELOPMENT OF A LASER FLUOROSENSOR FOR AIRBORNE SURVEYING OF THE AQUATIC ENVIRONMENT
Michael P. F. Bristow (Canada Centre for Remote Sensing), Wayne R. Houston, and Raymond M. Measures *In* NASA. Wallops Station The Use of Lasers for Hydrographic Studies 1975 p 119-136 refs
CSCL 20E

A field based laser fluorosensor, employing a pulsed nitrogen laser and telescope photomultiplier detector system, has been successfully tested at night from a cliff top site overlooking Lake Ontario providing target ranges greater than 274 meters. Remotely sensed spectra and amplitude changes in the fluorescence emission of natural waters have shown potential as a water quality indicator. In this connection, a convenient internal reference standard with which to gauge the amplitude of the fluorescence signal is realized in the form of the concurrent water Raman emission. Remote measurements of oil fluorescence emission spectra suggest that airborne laser fluorosensors are capable of detecting and characterizing the oil in a given slick and that environmental aging of these slicks does not significantly alter their fluorescence emission signature. Author

N75-30535* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MULTIWAVELENGTH LIDAR FOR REMOTE SENSING OF CHLOROPHYLL A IN ALGAE AND PHYTOPLANKTON
Peter B. Mumola, Olin Jarrett, Jr., and Clarence A. Brown, Jr. *In its* The Use of Lasers for Hydrographic Studies 1975 p 137-146
CSCL 20E

A theoretical and experimental analysis of laser induced fluorescence for remote detection of chlorophyll A in living algae and phytoplankton is presented. The fluorescent properties of various species of algae representative of the different color groups are described. Laboratory measurements of fluorescent scattering cross sections is discussed and quantitive data presented. A scattering matrix model is developed to demonstrate the essential requirement of multiwavelength laser excitation in order to make accurate quantitative measurements of chlorophyll A concentration when more than one color group of algae is present in the water. A practical airborne laser fluorosensor design is considered and analysis of field data discussed. Successful operation of the Langley ALOPE (airborne LIDAR oceanographic probing experiment) system is described and field measurements presented. Accurate knowledge of alpha, the optical attenuation coefficient of the water, is shown to be essential for quantitative analysis of chlorophyll A concentration. The feasibility of remotely measuring alpha by laser radar is discussed. Author

N75-30537* Toronto Univ. (Ontario). Inst. for Aerospace Studies.
LIFES: LASER INDUCED FLUORESCENCE AND ENVIRONMENTAL SENSING
Wayne R. Houston, D. G. Stephenson, and Raymond M. Measures *In* NASA. Wallops Station The Use of Lasers for Hydrographic Studies 1975 p 153-169 refs

CSCL 20E

A laboratory investigation has been conducted to evaluate the detection and identification capabilities of laser induced fluorescence as a remote sensing technique for the marine environment. The relative merits of fluorescence parameters including emission and excitation profiles, intensity and lifetime measurements are discussed in relation to the identification of specific targets of the marine environment including crude oils, refined petroleum products, fish oils and algae. Temporal profiles displaying the variation of lifetime with emission wavelength have proven to add a new dimension of specificity and simplicity to the technique. Author

N75-30538* Department of Environment, Ottawa (Ontario).
A REMOTE SENSING LASER FLUOROMETER
R. A. ONeill, Anthony R. Davis, Harry G. Gross, and J. Kruus *In* NASA. Wallops Station The Use of Lasers for Hydrographic studies 1975 p 173-196 refs

CSCL 20E

A sensor is reported which is able to identify certain specific substances in water by means of their fluorescence spectra. In particular, the sensor detects oil, ligninsulfonates and chlorophyll. The device is able to measure the fluorescence spectra of water at ranges up to 75 m and to detect oil spills on water at altitudes up to 300 m. Blue light from a laser is used to excite the fluorescence of the target. Any light from the ambient background illumination, from the reflected laser light or from the induced fluorescence is gathered by a small telescope focused on the target. Optical filters are used to block the reflected laser light and to select the wavelengths of interest in the fluorescence spectrum of the target. The remaining light is detected with a photomultiplier tube. The amplitude of the laser induced fluorescence in the wavelength interval selected by the optical filters is displayed on a meter or strip chart recorder. Author

N75-30539* National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
AN AIRBORNE LASER FLUOROSENSOR FOR THE DETECTION OF OIL ON WATER
Hongsuk H. Kim and George D. Hickman (Sparcom, Inc.) *In its* The Use of Lasers for Hydrographic Studies 1975 p 197-202 refs
CSCL 20E

An airborne laser fluorosensor for the detection of oil derivatives on water has been tested. The system transmits 337 nm UV radiation at the rate of 100 pulses per second and monitors fluorescent emission at 540 nm. Daylight flight tests were made over the areas of controlled oil spills and additional reconnaissance flights were made over a 50 km stretch of the Delaware River to establish ambient oil baseline in the river. The results show that the device is capable of monitoring and mapping out extremely low level oil on water which cannot be identified by ordinary photographic method. Author

N75-30634*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
THE FOCUS SERIES 1975: A COLLECTION OF SINGLE-CONCEPT REMOTE SENSING EDUCATIONAL MATERIALS
Shirley M. David 1975 47 p refs
(Contract NAS9-14016; Grant NGL-15-005-112)
(NASA-CR-144396; LARS-IN-052975; T-1039/4) Avail: NTIS HC $3.75 CSCL 08B

The Focus series has been developed to present basic remote sensing concepts in a simple, concise way. Issues currently available are collected here so that more people may know of their existance. Author

N75-30635*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
REMOTE SENSING STUDY OF MAUMEE RIVER EFFECTS OF LAKE ERIE
Roger Svehla, Charles Raquet, Don Shook, Jack Salzman, Thom Coney, Douglas Wachter, and Richard Gedney Jul. 1975 28 p refs
(NASA-TM-X-71780; E-8439) Avail: NTIS HC $3.75 CSCL 08H

The effects of river inputs on boundary waters were studied in partial support of the task to assess the significance of river inputs into receiving waters, dispersion of pollutants, and water quality. The effects of the spring runoff of the Maumee River on Lake Erie were assessed by a combination of ship survey and remote sensing techniques. The imagery obtained from a multispectral scanner of the west basin of Lake Erie is discussed: this clearly showed the distribution of particulates throughout the covered area. This synoptic view, in addition to its qualitative value, is very useful in selecting sampling stations for shipboard in situ measurements, and for extrapolating these quantitative results throughout the area of interest. Author

N75-30636*# Hidalgo (John U.), Inc., Metaire, La.
RESEARCH INVESTIGATIONS IN AND DEMONSTRATIONS OF REMOTE SENSING APPLICATIONS TO URBAN ENVIRONMENTAL PROBLEMS Final Report
John U. Hidalgo 25 Jul. 1975 67 p refs
(Contract NAS8-30882)
(NASA-CR-143924) Avail: NTIS HC $4.25 CSCL 05K

The applicability of remote sensing to transportation and traffic analysis, urban quality, and land use problems is discussed. Other topics discussed include preliminary user analysis, potential uses, traffic study by remote sensing, and urban condition analysis using ERTS. Author

N75-30637*# Alabama Univ., Huntsville. School of Graduate Studies and Research.
EARTH RESOURCES DATA ACQUISITION SENSOR STUDY Final Technical Report, 1 Dec. 1974 - 31 May 1975
Edward W. Grohse Jul. 1975 73 p refs
(Contract NAS8-31169)
(NASA-CR-143925) Avail: NTIS HC $4.25 CSCL 08H

The minimum data collection and data processing requirements are investigated for the development of water monitoring systems, which disregard redundant and irrelevant data and process only those data predictive of the onset of significant pollution events. Two approaches are immediately suggested: (1) adaptation of a presently available ambient air monitoring system developed by TVA, and (2) consideration of an air, water, and radiological monitoring system developed by the Georgia Tech Experiment Station. In order to apply monitoring systems, threshold values and maximum allowable rates of change of critical parameters such as dissolved oxygen and temperature are required. Author

N75-30639*# South Dakota State Univ., Brookings. Remote Sensing Inst.
AIRBORNE THERMOGRAPHY OF TEMPERATURE PATTERNS IN SUGAR BEET PILES
Donald G. Moore and Stanley Bichsel May 1975 21 p refs
(Grant NGL-42-003-007)
(NASA-CR-143384; RSI-SDSU-J-75-05) Avail: NTIS HC $3.25 CSCL 14C

An investigation was conducted to evaluate the use of thermography for locating spoilage areas (chimneys) within storage piles and to subsequently use the information for the scheduling of their processing. Thermal-infrared quantitative scanner data were acquired initially on January 16, 1975, over the storage piles at Moorhead, Minnesota, both during the day and predawn. Photographic data were acquired during the day mission to evaluate the effect of uneven snow cover on the thermal emittance, and the predawn thermography was used to locate potential chimneys. The piles were examined the day prior for indications of spoilage areas, and the ground crew indicated that no spoilage areas were located using their existing methods. Nine spoilage areas were interpreted from the thermography. The piles were rechecked by ground methods three days following the flights. Six of the nine areas delineated by thermography were actual spoilage areas. Author

N75-31565# Geological Survey, Reston, Va.
EAST AFRICA SEMINAR AND WORKSHOP ON REMOTE SENSING OF NATIONAL RESOURCES AND ENVIRONMENT Final Report
Morris Deutsch 3 Apr. 1974 200 p Conference held at Nairobi, Kenya, 21 Mar. - 3 Apr. 1974
(PB-241485/2; IR-NC-41) Avail: NTIS HC $7.00 CSCL 08F

This report covers the East Africa seminar and workshop on remote sensing of natural resources and the environment held in Nairobi, Kenya, March 21 - April 3, 1974, attended by participants from 10 English-speaking African nations. Appendices are included for seminar proceedings, workshop lectures and outlines, field trip reports and critiques by participants, and reports on potential applications of an operational earth resources satellite for the participating countries. GRA

N75-31938*# Caspan Corp., Houston, Tex. Engineers and Constructors.
REMOTE SENSING FOR LAND USE ANALYSIS Final Report
Jun. 1975 18 p
(Contract NAS9-12698)
(NASA-CR-144392) Avail: NTIS HC $3.25 CSCL 05B

Preparation of cataloging and indexing reports of land use remote sensor data is described. Topics discussed include: land use mapping and scribing; collation of LANDSAT investigation reports; and reformating and collation of Skylab 4 tabular and plot data for data bank entry. J.M.S.

N75-32571*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT: NON-US STANDARD CATALOG NO. N-36
31 Aug. 1975 126 p
(NASA-TM-X-72512) Avail: NTIS HC $5.75 CSCL 05B

Information regarding the availability of LANDSAT imagery processed and input to the data files by the NASA Data Processing Facility is published on a monthly basis. The U.S. Standard Catalog includes imagery covering the continental United States, Alaska, and Hawaii. The Non-U.S. Standard Catalog identifies all the remaining coverage. Sections 1 and 2 describe the contents and format for the catalogs and the associated microfilm. Section 3 provides a cross reference defining the beginning and ending dates for LANDSAT cycles. Author

N75-32572*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT: US STANDARD CATALOG NO. U-36
31 Aug. 1975 80 p
(NASA-TM-X-72513) Avail: NTIS CSCL 05B

Information regarding the availability of LANDSAT imagery which has been processed and input to the data files during the referenced month is presented. The U.S. Standard Catalog includes imagery covering the continental United States, Alaska and Hawaii as well as that from adjacent areas. Author

N75-33444*+ National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT: NON-US STANDARD CATALOG NO. N-30
28 Feb. 1975 55 p
(NASA-TM-X-72891) Avail: NTIS HC $4.25; EROS Data Center, Sioux Falls, S. D., 57198 HC $1.25 CSCL 05B

Information regarding the availability of LANDSAT imagery processed and input to the data files by the NASA Data Processing Facility is published on a monthly basis. The U.S. Standard Catalog includes imagery covering the continental United States, Alaska, and Hawaii. The Non-U.S. Standard Catalog identifies all the remaining coverage. Sections 1 and 2 describe the contents and format for the catalogs and the associated microfilm. Section 3 provides a cross-reference defining the beginning and ending dates for LANDSAT cycles. Author

N75-33445* + National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT: NON-US STANDARD CATALOG NO. N-31
31 Mar. 1975 110 p
(NASA-TM-X-72892) Avail: NTIS HC $5.25; EROS Data Center, Sioux Falls, S. D., 57198 HC $1.25 CSCL 05B
For abstract, see N75-33444.

N75-33446* + National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT: NON-US STANDARD CATALOG NO. N-32
30 Apr. 1975 93 p
(NASA-TM-X-72893) Avail: NTIS HC $4.75; EROS Data Center, Sioux Falls, S. D., 57198 HC $1.25 CSCL 05B
For abstract, see N75-33444.

N75-33459*# Bureau of Reclamation, Denver, Colo.
USE OF THE LANDSAT-2 DATA COLLECTION SYSTEM IN THE COLORADO RIVER BASIN WEATHER MODIFICATION PROGRAM Progress Report, 1 Apr. - 30 Jun. 1975
Archie M. Kahan, Principal Investigator 30 Jun. 1975 6 p ERTS
(Contract NASA Order S-70243-AG-8)
(E75-10404; NASA-CR-143397) Avail: NTIS HC $3.25 CSCL 04B

The author has identified the following significant results. Operation of the LANDSAT data collection system continues to indicate that the network is of practical means to obtain data in near real time to aid in forecasting and control of weather modification operations. Tests of the wind averaging circuit development indicate that the methodology is feasible.

N75-33468*# National Ocean Survey, Rockville, Md.
ANALYTIC AEROTRIANGULATION UTILIZING SKYLAB EARTH TERRAIN CAMERA (S-190B) PHOTOGRAPHY Final Report
Morton Keller, Principal Investigator Jul. 1975 105 p refs EREP
(Contract NASA Order T-4110-B)
(E75-10413; NASA-CR-144387) Avail: NTIS HC $5.25 CSCL 08B

The author has identified the following significant results. Inherent errors in using nonmetric Skylab photography and office-identified photo control made it necessary to perform numerous block adjustment solutions involving different combinations of control and weights. The final block adjustment was executed holding to 14 of the office-identified photo control points. Solution accuracy was evaluated by comparing the analytically computed ground positions of the withheld photo control points with their known ground positions and also by determining the standard errors of these points from variance values. A horizontal position RMS error of 15 meters was attained. The maximum observed error in position at a control point was 25 meters.

N75-33483*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
REMOTELY SENSING WHEAT MATURATION WITH RADAR
Thomas F. Bush and Fawwaz T. Ulaby May 1975 126 p refs
(Contract NAS9-10261)
(NASA-CR-144507; RSL-TR-177-55) Avail: NTIS HC $5.75 CSCL 02C

The scattering properties of wheat were studied in the 8-18 GHz band as a function of frequency, polarization, incidence angle, and crop maturity. Supporting ground truth was collected at the time of measurement. The data indicate that the radar backscattering coefficient is sensitive to both radar system parameters and crop characteristics particularly at incidence angles near nadir. Linear regression analyses of the radar backscattering coefficient on both time and plant moisture content result in rather good correlation. Furthermore, by calculating the average time rate of change of the radar backscattering coefficient it is found that it undergoes rapid variations shortly before and after the wheat is harvested. Both of these analyses suggest methods for estimating wheat maturity and for monitoring the progress of harvest. Author

N75-33729# Texas Instruments, Inc., Dallas. Equipment Group.
MINE AIR MONITOR Final Report, 19 Jun. 1972 - 17 Jun. 1974
David Collins and Arnold Stalder 17 Jun. 1974 53 p
(Contract DI-BM-HO-122044)
(PB-242488/5; BM-OFR-43-75) Avail: NTIS HC $4.25 CSCL 08I

Two portable, battery powered, breathing air monitors are reported for toxic gases CO and NO2 and for oxygen deficiency for use in underground mines including coal mines. The device used commercially available electrochemical transducers, features audible and visual alarms with adjustable threshold levels, selectable digital readout of gas concentrations, alarm level set points, and battery condition. It can run continuously for 30 hours from batteries before recharging is necessary. This report details the design effort including electrochemical cell characterization of response versus temperature, and contains portions of operation and instruction manual. GRA

09
GENERAL

Includes economic analysis.

A75-38867 **The current development programmes.** *ESA Bulletin,* June 1975, p. 17-39. In English and French.

The paper summarizes the goals, state of development, and time schedules for the various satellite and scientific studies programs currently being developed under the guidance of the European Space Agency (ESA). These projects include (1) scientific and meteorological satellite programs - COS-B for cosmic ray studies, GEOS for magnetospheric studies, IUE for ultraviolet research, ISEE-B for study of sun-earth relations, EXOSAT for X-ray observations, and the METEOSAT meteorological satellite; (2) telecommunications satellite programs - ECS, MAROTS, and AEROSAT; (3) the SPACELAB program; and (4) the ARIANE program. P.T.H.

A75-39078 **An information system for scheduling sensor equipped environmental surveillance aircraft.** L. J. McKell (Brigham Young University, Provo, Utah) and G. P. Wright (Purdue University, West Lafayette, Ind.). In: International Instrumentation-Automation Conference, New York, N.Y., October 28-31, 1974, Proceedings. Part 1. Pittsburgh, Instrument Society of America, 1974, p. 540.1-540.7. 9 refs.

The paper describes the development of a sophisticated surveillance scheduling system for directing U.S. Coast Guard pollution surveillance patrols, with emphasis on how the problem was solved with a basically user-oriented approach. A basic optimization model for solving the surveillance scheduling model was developed that consisted of a linear objective function subject to a set of linear constraints. The design and development of an Optimal Pollution Surveillance Schedule Generating System (OPGENS) provided a structure for implementing various algorithms for solving this and other surveillance models. The content and use of schedules produced by OPGENS are explained. P.T.H.

A75-39602 * **The role of horizontal transport as evaluated from the Apollo 15 and 16 orbital experiments.** I. Adler, M. Podwysocki, C. Andre (Maryland, University, College Park, Md.), J. Trombka, E. Eller, R. Schmadebeck, and L. Yin (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Lunar Science Conference, 5th, Houston, Tex., March 18-22, 1974, Proceedings. Volume 2. New York, Pergamon Press, Inc., 1974, p. 975-979. 9 refs.

Despite the large amount of accumulated data there is still considerable debate about the role of various processes in the formation of the lunar surface. One of the processes frequently discussed is that of horizontal transport and how it affected surface chemistry and surface features. The orbital experiments flown on Apollo 15 and 16 enable us to consider the extent of horizontal transport. In particular, the X-ray experiment because of its low penetration depth permits us to make at least crude estimates of the extent of horizontal transport. *(Author)*

A75-40601 **Technology today for tomorrow; Proceedings of the Twelfth Space Congress, Cocoa Beach, Fla., April 9-11, 1975.** Cocoa Beach, Fla., Canaveral Council of Technical Societies, 1975. 251 p. $21.25.

The papers deal with technological developments and programs in the fields of astronautics, aeronautics, meteorology, marine sciences, and energy production. Topics include a fog modification project, the present state of air pollution control, hurricane forecasting techniques, satellite oceanographic studies, Skylab space-processing experiments, the Apollo-Soyuz docking system, the Viking mission to Mars, research and development programs for alternate energy sources, solar energy facilities, the Space Shuttle program, the SEASAT program, the European Spacelab program, and international aspects of the U.S. space program.

Individual items are announced in this issue. F.G.M.

A75-40605 **The role of the meteorological satellite in the Air Force Air Weather Service's tailored environmental advice.** W. D. Meyer (USAF, Air Weather Service, Scott AFB, Ill.). In: Technology today for tomorrow; Proceedings of the Twelfth Space Congress, Cocoa Beach, Fla., April 9-11, 1975. Cocoa Beach, Fla., Canaveral Council of Technical Societies, 1975, p. 2-19 to 2-26.

With the launch of the first meteorological satellite in 1960, many scientists felt that this new tool would revolutionize the science of meteorology and result in substantially improved weather forecasts. While this revolution has been slow in coming, significant contributions have been made by this tool to the weather support requirements of the Air Force Weather Service. This paper highlights a number of these contributions and summarizes how the Air Force Weather Service effectively uses and plans to use this tool in providing tailored environmental advice to its customers. (Author)

A75-40607 * **The U.S. SEASAT program.** S. W. McCandless (NASA, Washington, D.C.) and T. W. Thompson (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: Technology today for tomorrow; Proceedings of the Twelfth Space Congress, Cocoa Beach, Fla., April 9-11, 1975.
Cocoa Beach, Fla., Canaveral Council of Technical Societies, 1975, p. 3-1 to 3-8.

The SEASAT program is a space-based operational oceanographic measurement system, which will be capable of providing continuous, all-weather, world-wide, timely data on global ocean dynamics and other physical properties of practical importance to a wide community of governmental and private sector users. This paper describes user requirements, case studies of projected applications, the sensor systems employed, and testing programs. (Author)

A75-41436 **Skylab science experiments; Proceedings of the Symposium, San Francisco, Calif., February 28, 1974.** Symposium sponsored by AAAS, AAS, and ORSA. Edited by G. W. Morgenthaler and G. E. Simonson (Martin Marietta Aerospace, Rockville, Md.). Tarzana, Calif., American Astronautical Society (Science and Technology Series. Volume 38), 1975. 271 p. $20.

Papers are presented which report on some of the chief experiments conducted on board Skylab in astronomical observations, space-based applications, life sciences, and earth remote sensing applications. Some of the topics covered include Skylab deep space experiments, Skylab solar astronomy experiments, InSb crystal growth and segregation behavior under zero gravity conditions, crystal growth of IV-VI compounds by vapor transport in space, response of single human cells to zero gravity, vestibular effects in the orbital stage, and Skylab data and water resource management. P.T.H.

A75-42664 # **The role of Spacelab in the long term programme planning for an Earth Observation System.** D. Meissner and B. Kunkel (Messerschmitt-Bölkow-Blohm GmbH, Munich, West Germany). *(British Interplanetary Society, Symposium on European Participation in Earth Resources /Space/ Projects, University College of Science and Technology, London, England, Apr. 9, 1975.) British Interplanetary Society, Journal,* vol. 28, Sept.-Oct. 1975, p. 595-607. 10 refs.

A variety of typical European user requirements and experiment proposals for spaceborne remote sensing have been established. MBB has defined an Earth Observation Payload which was selected as the European Reference Payload for Spacelab with respect to these European user requirements. As a result, analyses of defined payloads and missions have been carried out and a step-wise build-up philosophy of increasing sensor and data management capabilities has been established, making use of Spacelab as a manned space test

platform. Furthermore, suitable orbits have been selected and the possible role of man investigated. Such a Spacelab payload is considered as part of a long term programme for a later global operational Earth Observation System, replacing several test satellites, and being a decision aid on whether man might play an irreplaceable role in such a system. (Author)

A75-42669 # **Contribution of ERTS-1 and Skylab missions to regional studies in Italy.** A. M. Tonelli (CNR, Laboratorio per la Geofisica della Litosfera, Milan, Italy). *(British Interplanetary Society, Symposium on European Participation in Earth Resources /Space/ Projects, University College of Science and Technology, London, England, Apr. 9, 1975.) British Interplanetary Society, Journal,* vol. 28, Sept.-Oct. 1975, p. 647-652. 19 refs.

This paper deals with the electro-optical processing of ERTS and Skylab imageries to extract geological features and other patterns of interest. Examples are presented, in particular the studies carried out on the Venetian Plain and on Sicily such as paleoriverbed mapping and the classification of soils and vegetation. By the means of certain surface indicators, a structural study of the central part of Sicily is presented on the basis of ERTS image correlations and through the spatial and temporal distribution of the vegetation canopy. Finally, an example of thermal infrared scanning applied to paleoriverbed detection is presented. (Author)

A75-42672 # **An attitude sensing technique for earth resources survey rockets, using RF interferometry.** G. Mayer and G. E. Todd (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Oberpfaffenhofen, West Germany). *(British Interplanetary Society, Symposium on European Participation in Earth Resources /Space/ Projects, University College of Science and Technology, London, England, Apr. 9, 1975.) British Interplanetary Society, Journal,* vol. 28, Sept.-Oct. 1975, p. 673-680.

A simple sensor is described, which was primarily designed for use on earth resources survey rockets but would also be of use for the attitude stabilization of space vehicles in general. The system uses an airborne radio interferometer to control the payload in the propagation direction of the incident wave from UHF transmitter beacons located at the points of interest in an earth resources survey. (Author)

A75-43874 * # **Annual review of earth observations from space.** W. Nordberg (NASA, Goddard Space Flight Center, Greenbelt, Md.). *COSPAR, Plenary Meeting, 18th, Varna, Bulgaria, May 29-June 7, 1975, Paper.* 17 p. 15 refs.

An overview is given of the present state of satellites making observations of the earth. Satellite systems discussed include the NOAA series of Synchronous Meteorological Satellites (SMS) and sun-synchronous satellites, the two LANDSATS (formerly called ERTS), and the NIMBUS series. Examples are presented of the types of observations being made as well as their purposes. These include observations of synoptic and mesoscale atmospheric processes for daily weather forecasting, global atmospheric processes for long-range weather forecasting, planetary radiation budget and ocean circulation for monitoring climatic trends, earth dynamics and tectonic structure for mineral exploration and assessing earthquake hazards, atmospheric composition and water quality for environment monitoring, and thematic mapping for monitoring land use, managing crops and water resources, and assessing environmental impacts. F.G.M.

A75-44379 * **Conference on Cloud Physics, Tucson, Ariz., October 21-24, 1974, Proceedings.** Conference supported by the American Meteorological Society and NASA. Boston, American Meteorological Society, 1975. 485 p. Members, $15.; nonmembers, $20.

Condensation and ice nucleation processes are considered, taking into account measurements of cloud nuclei and aerosol size spectra in the semiarid Southwest, the formation of sulfates and the enhancement of cloud condensation nuclei in clouds, biogenic sources of atmospheric ice nuclei, and the experimental determination of the deposition coefficient of water vapor onto ice. Other topics discussed are related to precipitation growth processes, the role of ice in cloud systems, cloud modeling, measurements in Colorado hailstorms during the national hail research experiment, cloud measurements, and measurement techniques. Attention is also given to cloud electrification, zero-gravity experiments, and the control of cloud development by larger scale motions. G.R.

A75-44604 **Bayesian decision theory and remote sensing.** T. J. Jackson and R. M. Ragan (Maryland, University, College Park, Md.). *Photogrammetric Engineering and Remote Sensing,* vol. 41, Sept. 1975, p. 1139-1143.

Determination of the most economically efficient data source requires evaluation of the net benefits of the information provided. Economic analysis using Bayesian decision theory allows the potential user of remotely sensed information to determine the expected value of the information before he purchases it. An outline of Bayesian decision theory for finite-discrete problems is presented. Basically, the technique converts statistical information of source performance into monetary terms. An example problem in land use identification for water resources planning is discussed. It is shown that Bayesian decision theory may be used to determine the net benefits of remote sensing data derived from small-scale imagery vs that derived form more accurate yet more costly large-scale imagery. S.D.

A75-45831 * # **Earth Resources Survey Program, new results - 1975.** J. R. Morrison (NASA, Washington, D.C.). *International Astronautical Federation, International Astronautical Congress, 26th, Lisbon, Portugal, Sept. 21-27, 1975, Paper 75-143.* 7 p.

Recent results of the Earth Resources Survey Program are placed in a historical and programmatic context. In particular, the operations involved in the LANDSAT satellite series are described. The value of large-scale imagery is stressed. It is concluded that the technology of remote sensing is expanding so rapidly that a great many more advances can be expected in the near future. S.J.M.

A75-45848 * **Earth and ocean dynamics satellites and systems.** F. O. Vonbun (NASA, Goddard Space Flight Center, Greenbelt, Md.). *International Astronautical Federation, International Astronautical Congress, 26th, Lisbon, Portugal, Sept. 21-27, 1975, Paper 75-121.* 38 p. 37 refs.

An overview is presented of the present state of satellite and ground systems which are used for studies concerning the dynamics of the solid earth and the oceans. It is pointed out that very good progress has been made in the area of earth and ocean dynamics since the described program was initiated in 1969. Construction of the mathematical models needed for data interpretation and analyses for earth dynamics phenomena and for ocean dynamics are in progress. G.R.

A75-45864 * # **Cost reductions through earth resource satellites in developed countries.** R. L. Schweickart and A. C. Buffalano (NASA, Washington, D.C.). *International Astronautical Federation, International Astronautical Congress, 26th, Lisbon, Portugal, Sept. 21-27, 1975, Paper A75-010.* 20 p. 14 refs.

Data from detailed studies on the possible economic impact of the use of remote sensing technology in industry and agriculture are presented and analyzed. The utility of satellite surveillance in reduction of crop production forecast error, recognition and monitoring of crop diseases and insect infestations, and range management is evaluated. Application of satellite maps to facilitate land resource decisions, mineral exploration, geological studies, and water resource inventories is considered, as is the usefulness of early storm warning in the reduction of property damage. The cost of remote sensing is compared to that of conventional methods whenever possible. C.K.D.

A75-45866 * **The early scientific history of the rocket-grenade experiment.** W. G. Stroud (NASA, Goddard Space Flight Center, Greenbelt, Md.). *International Astronautical Federation, International Astronautical Congress, 26th, Lisbon, Portugal, Sept. 21-27, 1975, Paper A75-043.* 22 p. 16 refs.

In the decade, 1950 to 1960, some thirty sounding rockets carrying the grenade experiment were fired in the Arctic, at middle latitudes and in the equatorial western Pacific. The vertical distributions of temperatures and winds at different seasons and at different times of the day were measured. Although there were significant variations in the results from each of the sites, an outstanding feature was the uniformity with latitude of the seasonal variation of the wind field. Over the latitude-altitude ranges sampled, the winds were strong and from the west during the winter months; and weak and from the east during the summer months. The nature of the general circulation pattern in the mesosphere of the northern hemisphere was revealed by the measurements. Of particular interest were those measurements made at the seasonal turnovers because of the insight into the dynamics of this region they provided. (Author)

A75-45890 # **The legal status of the geostationary orbit.** W. v. Kries (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Cologne, West Germany). *International Astronautical Federation, International Astronautical Congress, 26th, Lisbon, Portugal, Sept. 21-27, 1975, Paper.* 18 p. 28 refs.

Questions which have arisen in connection with the use of geostationary orbits are related to the capacity of the geostationary orbit and the need for international orbit management. Attention is given to the definition of geostationary orbits, the mission objectives of geostationary satellites, and legal considerations concerning the use of the geostationary orbit. Problems related to the utilization of the geostationary orbit are considered, taking into account aspects of current and future use, orbit capacity limitations, international and national regulations, and required management activities. G.R.

A75-46673 * ***On the use of the earth resources technology satellite /LANDSAT-1/ in optical oceanography.*** G. A. Maul (NOAA, Physical Oceanography Laboratory, Miami, Fla.) and H. R. Gordon (Miami, University, Coral Gables, Fla.). *Remote Sensing of Environment,* vol. 4, no. 2, 1975, p. 95-128. 41 refs. NASA Order S-70246-AG.

Observations of the Gulf Stream System in the Gulf of Mexico were obtained in synchronization with LANDSAT-1. Computer enhanced images, which are necessary to extract useful oceanic information, show that the current can be observed by color (diffuse radiance) or sea state (specular radiance) effects associated with the cyclonic boundary even in the absence of a surface thermal signature. The color effect relates to the spectral variations in the optical properties of the water and its suspended particles, and is studied by radiative transfer theory. Significant oceanic parameters identified are: the probability of forward scattering, and the ratio of scattering to total attenuation. Several spectra of upwelling diffuse light are computed as a function of the concentration of particles and yellow substance. (Author)

A75-47333 # **Coordination and management of resources for learning and their application to satellite systems for education.** T. Singleton (British Council, London, England). *(Royal Society, Discussion on the Introduction of Satellites into Education Systems, London, England, Sept. 19, 20, 1974.) Royal Society (London), Proceedings, Series A,* vol. 345, no. 1643, Oct. 7, 1975, p. 531-538; Discussion, p. 538, 539.

The promise of massive coverage of large geographical areas of the world by satellite transmissions has excited politicians for over a decade. It has not excited the imaginations of managers of educational systems and administrators. The developing countries seek ways to short circuit the educational methodologies of the present. The pressing needs of rapidly developing societies demand action and the need for governments to respond and communicate to the under-privileged has been identified as central to development. The adoption of satellite technology and the harnessing of its potential has yet to be fully realized. A massive management programme of earth-bound resources will be necessary, and this paper endeavours to provide a framework for discussion. (Author)

N75-28477 Pennsylvania Univ., Philadelphia.
ANALYSIS OF SCENES AS SEEN FROM THE EARTH'S SATELLITES Ph.D. Thesis
Mohamad Tavakoli 1974 246 p
Avail: Univ. Microfilms Order No. 75-14631

The use of pattern recognition methods in the recognition of agricultural areas and vegetation obtained from satellites pictures is presented. However, these methods neglect some very important spatial features such as spatial relationships or shapes and the fact that the recognition process is essentially an interpretation of two-dimensional pictures within the three-dimensional world. A recognition process, as a process of continuously refined descriptions of the hypothesized objects is described. Conceptual identifications of objects during the recognition process with meanings in the three-dimensional world are discussed. The representation of the environment with respect to the observer called the world model is also discussed. A successful recognition of computer scenes, such as the earth seen from a satellite, by using geometric properties in addition to spectral ones is shown. Dissert. Abstr.

N75-28513# Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Minerals Engineering.
IMPACT OF HIGHER ECOLOGICAL COSTS ON SURFACE MINING Research Report, Jun. 1973 - Jun. 1974
W. E. Foreman Jun. 1974 172 p refs
(Grant DI-G-0133102)
(PB-240441/6; GM-OFR-12-75) Avail: NTIS MF $6.25 CSCL 08I

A mathematical model was developed to assess the costs for reclamation of surface mining using the shovel overcasting operation, the front end loader operation, and a backfilling operation. It was determined that the working mathematical model would have to be applied on an area to area basis, preferably on a permit by permit basis in the area where surface mining was being done. To this end, a flexible model was developed with input data obtained from the area of study. The results of the study show that the cost per ton of coal for reclamation can be estimated for various reclamation levels. Validation of the model was done for selected permits from Virginia. GRA

N75-28595*# Ohio State Univ. Research Foundation, Columbus. Dept. of Geodetic Science.
BASIC RESEARCH AND DATA ANALYSIS FOR THE EARTH AND OCEAN PHYSICS APPLICATIONS PROGRAM AND FOR THE NATIONAL GEODETIC SATELLITE PROGRAM Semiannual Status Report, Jan. - Jun. 1975
Jul. 1975 65 p refs
(Grant NGL-36-008-093; NGR-36-008-204; OSURF Proj. 3820-A1; OSURF Proj. 2514)
(NASA-CR-143212; SASR-4; SASR-16) Avail: NTIS HC $4.25 CSCL 08E

Data acquisition using single image and seven image data processing is used to provide a precise and accurate geometric description of the earth's surface. Transformation parameters and network distortions are determined. Sea slope along the continental boundaries of the U.S. and earth rotation are examined, along with close grid geodynamic satellite system. Data are derived for a mathematical description of the earth's gravitational field; time variations are determined for geometry of the ocean surface, the solid earth, gravity field, and other geophysical parameters. J.A.M.

N75-29159# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
AFCRL CONTRIBUTIONS TO THE NATIONAL GEODETIC SATELLITE PROGRAM (NGSP) Air Force Surveys in Geophysics

George Hadigeorge, Theodore E. Wirtanen, Robert L. Iliff, Donald H. Eckhardt, and Duane C. Brown 2 May 1974 143 p refs (AF Proj. 7600)
(AD-A006110; AFCRL-AFSIG-287; AFCRL-TR-74-0217) Avail: NTIS CSCL 08/5

Contents: The use of artificial satellites for geodesy; Satellite and ground instrumentation; AFCRL laser-satellite geodesy; AFCRL geodetic dual laser system; intervisible (geometric) adjustment theory; Short arc geodetic adjustment (SAGA) theory; geometric results from geodetic satellite (ANNA 1B) optical data; improvement of the GEOS-1 North American tracking network from multiple short arc geodetic adjustments; near term prospects for positional accuracies of 0.1 to 1.0 meters from satellite geodesy; results from simulations of continuously integrated Doppler for precise aircraft positioning; simultaneous recovery of satellite and station positions utilizing the short arc method; least-squares collocation method for combination of satellite-derived gravitational and terrestrial gravity. GRA

N75-29393# Army Foreign Science and Technology Center, Charlottesville, Va.
APPLICATION OF THE HELICOPTER KA-26 TO LARGE-SCALE AERIAL PHOTOGRAPHY
A. G. Vanin and A. Yu. Tankus 23 Jan. 1974 11 p Transl. into ENGLISH from Geodeziya i Kartografiya (USSR), no. 6, 1972 p 35-40
(AD-A005950; FSTC-HT-23-0826-73) Avail: NTIS CSCL 14/5

The KA-26 helicopter and its use in large-scale aerial photography is described. Weight, camera characteristics, photographic speeds and area limitations are discussed in detail. GRA

N75-29540# North Carolina Univ., Chapel Hill. School of Law.
LEGAL ASPECTS OF PHOSPHATE MINING IN NORTH CAROLINA Sea Grant Publication
Michael A. Almond Feb. 1975 31 p
(Grant NOAA-04-3-158-40)
(COM-75-10504/9; UNC-SG-75-05; NOAA-75040401) Avail: NTIS HC $3.75 CSCL 05D

The removal of phosphate, critically needed to provide fertilizer to increase crop yields, from beneath navigable waters of North Carolina produces adverse effects upon marine life adjacent to the operation. Pertinent North Carolina statutes and legal thinking likely to be used in the administrative or legal solution of the problem are presented. It is indicated that flexible regulation may provide the only viable answers. GRA

N75-30621*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA Quarterly Progress Report, 31 Oct. 1974 - 31 Jan. 1975
John W. Hannah, Garland L. Thomas (Brevard County Planning Dept., Merritt Island, Fla.), Fernando Esparza, Principal Investigators, and James J. Millard 31 Jan. 1975 10 p EREP
(Contract NASA Order CC-30281-A)
(E75-10388; NASA-TM-X-72453) Avail: NTIS HC $3.25 CSCL 08B

N75-30628*# Martin Marietta Corp., Baltimore, Md.
SKYLAB PROGRAM EARTH RESOURCES EXPERIMENT PACKAGE: GROUND TRUTH DATA FOR TEST SITES (SL-2)
15 Aug. 1975 85 p
(Contract NAS8-24000)
(NASA-CR-14910; MSC-05531) Avail: NTIS HC$4.75 CSCL 08G

Field measurements were performed at selected ground sites in order to provide comparative calibration measurements of sensors for the Earth Resources Experiment Package. Specifically, the solar radiation (400 to 1300 namometers) and thermal radiation (8-14 micrometers) were measured. Sites employed for the thermal measurements consisted of warm and cold water lakes. The thermal brightness temperature of the lake water, the temperature and humidity profile above the lake, and near surface meteorology (wind speed, pressure, etc.) were measured near the time of overpass. Sites employed for the solar radiation measurements were two desert type sites. Ground measurements consisted of: (1) direct solar radiation - optical depth; (2) diffuse solar radiation; (3) total solar radiation, (4) target directional (normal) reflectance; (5) target hemispherical reflectance; and (6) near surface meteorology. Author

N75-30640*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANNUAL REVIEW OF EARTH OBSERVATIONS FROM SPACE
William Nordberg Aug. 1975 16 p refs Presented at the 18th Plenary Meeting of COSPAR, Varna, Bulgaria, 3 Jun. 1975
(NASA-TM-X-70957; X-900-75-208) Avail: NTIS HC $3.25 CSCL 08E

An overview of the present use of satellites for observation of the earth is presented. It is pointed out that instead of being, as previously, limited to relatively narrow objectives, earth observations with much broader objectives are being pursued, so as to gain better understanding of the general circulation of the atmosphere, of geophysical processes in the oceans and solid earth, and of climatic variations. Applications of these observations to such practical concerns as the distribution of food and water resources and environmental protection are illustrated. The use of the LANDSAT and NIMBUS satellites in meeting the requirements of the Global Atmospheric Research Program is described. Author

N75-31147 European Space Research Organization, Paris (France).
PRESENT AND FUTURE EUROPEAN SPACE APPLICATIONS MISSIONS
A. Dattner, M. Fournet, and J. Collet *In its* European Capabilities for Space Appl. 1975 35 p Partly in ENGLISH; partly in FRENCH (For availability see N75-31129 22-12)

European application satellites, other than communication satellites, are discussed: meteorology, earth resources, and geodesy point determination. Future trends of satellite communications in Europe are dealt with, such as data transmission, computer communication, remote printing, teleconferencing, offshore oil exploration, and sound and television broadcasting. ESRO

N75-31544*# General Electric Co., Philadelphia, Pa. Space Div.
TERSSE: DEFINITION OF THE TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA. VOLUME 1: EARTH RESOURCES PROGRAM SCOPE AND INFORMATION NEEDS
Nov. 1974 443 p
(Contract NAS9-13401)
(NASA-CR-141767) Avail: NTIS HC $11.25 CSCL 05B

The form of the Total Earth Resources System in the Shuttle Era (TERSSE), a complex system of data gathering, translation, distribution, and utilization functions, is investigated. Methods for analyzing potential user requirements developed and used to form a broad base of user information requirements for system design are described. It is indicated that TERSSE is comprised of a research and development segment and an operational segment, each interfacing with two major communities of operational users: resource managers and scientists. The Scope and interfaces of each segment are defined along with earth resources information requirements, resource management activities of potential user organizations, and information requirements of the user organizations. J.M.S.

N75-31545*# General Electric Co., Philadelphia, Pa. Space Div.
TERSSE: DEFINITION OF THE TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA. VOLUME 2: AN ASSESSMENT OF THE CURRENT STATE-OF-THE-ART
Oct. 1974 239 p
(Contract NAS9-13401)
(NASA-CR-141768) Avail: NTIS HC $7.50 CSCL 05B

Results of a state-of-the-art assessment of technology areas which affect the Earth Resources Program are presented along with a functional description of the basic earth resources system. Major areas discussed include: spacecraft flight hardware, remote sensors, data processing techniques and hardware, user models, user interfaces, and operations technology. J.M.S.

N75-31546*# General Electric Co., Philadelphia, Pa. Space Div.
TERSSE: DEFINITION OF THE TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA. VOLUME 3: MISSION AND SYSTEM REQUIREMENTS FOR THE TOTAL EARTH RESOURCES SYSTEM
Nov. 1974 258 p
(Contract NAS9-13401)
(NASA-CR-141769) Avail: NTIS HC $8.50 CSCL 05B

Resource management missions to be performed by TERSSE are described. Mission and user requirements are defined along with information flows developed for each major resource management mission. Other topics discussed include: remote sensing platforms, remote sensor requirements, ground system architecture, and such related issues as cloud cover, resolution, orbit mechanics, and aircraft versus satellite. J.M.S.

N75-31547*# General Electric Co., Philadelphia, Pa. Space Div.
TERSSE: DEFINITION OF THE TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA. VOLUME 4: THE ROLE OF THE SHUTTLE IN THE EARTH RESOURCES PROGRAM
Nov. 1974 134 p
(Contract NAS9-13401)
(NASA-CR-141770) Avail: NTIS HC $5.75 CSCL 05B

The potential of the space shuttle as a platform for captive earth resources payloads in the sortie mode, and as a launch and services vehicle for automated earth resources spacecraft is examined. The capabilities of the total space transportation system which are pertinent to earth resources sorties and automated spacecraft are included. J.M.S.

N75-31548*# General Electric Co., Philadelphia, Pa. Space Div.
TERSSE: DEFINITION OF THE TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA. VOLUME 5: DETAILED SYSTEM REQUIREMENTS: TWO CASE STUDIES
Nov. 1974 310 p refs
(Contract NAS9-13401)
(NASA-CR-141771) Avail: NTIS HC $9.25 CSCL 05B

Major resource management missions to be performed by the TERSSE are examined in order to develop an understanding of the form and function of a system designed to perform an operational mission. Factors discussed include: resource manager (user) functions, methods of performing their function, the information flows and information requirements embodied in their function, and the characteristics of the observation system which assists in the management of the resource involved. The missions selected for study are: world crop survey and land resources management. These missions are found to represent opposite ends of the TERSSE spectrum and to support the conclusion that different missions require different systems and must be analyzed in detail to permit proper system development decisions. Author

N75-31549*# General Electric Co., Philadelphia, Pa. Space Div.
TERSSE: DEFINITION OF THE TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA. VOLUME 6: AN EARLY SHUTTLE PALLET CONCEPT FOR THE EARTH RESOURCES PROGRAM
Nov. 1974 70 p
(Contract NAS9-13401)
(NASA-CR-141772) Avail: NTIS HC $4.25 CSCL 05B

A space shuttle sortie mission which can be performed inexpensively in the early shuttle era and which, if the necessary intermediate steps are accomplished provides a major technological advance for the user organization-the U.S. Bureau of Census is described. The orbital configuration created for the Urban Land Use/1980 Census mission is illustrated including sensors and ground support equipment along with the information flow for the mission. Factors discussed include: specific Census Bureau functions to be supported by the mission; hardware and flight operations necessary for implementation of the mission; and integration of the TERSSE pallet into a shuttle mission. J.M.S.

N75-31550*# General Electric Co., Philadelphia, Pa. Space Div.
TERSSE: DEFINITION OF THE TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA. VOLUME 7: USER MODELS: A SYSTEM ASSESSMENT
Oct. 1974 91 p
(Contract NAS9-13401)
(NASA-CR-141773) Avail: NTIS HC $4.75 CSCL 05B

User models defined as any explicit process or procedure used to transform information extracted from remotely sensed data into a form useful as a resource management information input are discussed. The role of the user models as information, technological, and operations interfaces between the TERSSE and the resource managers is emphasized. It is recommended that guidelines and management strategies be developed for a systems approach to user model development. J.M.S.

N75-31551*# General Electric Co., Philadelphia, Pa. Space Div.
TERSSE: DEFINITION OF THE TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA. VOLUME 8: USER'S MISSION AND SYSTEM REQUIREMENTS DATA (APPENDIX A OF VOLUME 3)
Oct. 1974 303 p
(Contract NAS9-13401)
(NASA-CR-141774) Avail: NTIS HC $9.25 CSCL 05B

A computer printout is presented of the mission requirement for the TERSSE missions and their associated user tasks. The data included in the data base represents a broad-based attempt to define the amount, extent, and type of information needed for an earth resources management program in the era of the space shuttle. An effort was made to consider all aspects of remote sensing and resource management; because of its broad scope, it is not intended that the data be used without verification for in-depth studies of particular missions and/or users. The data base represents the quantitative structure necessary to define the TERSSE architecture and requirements, and to an overall integrated view of the earth resources technology requirements of the 1980's. Author

N75-31552*# General Electric Co., Philadelphia, Pa. Advanced NASA Program Office.
TERSSE: DEFINITION OF THE TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA: EXECUTIVE SUMMARY
Mar. 1975 29 p Prepared in cooperation with Environ. Res. Inst. of Mich., Ann Arbor, Mich.
(Contract NAS9-13401)
(NASA-CR-141766) Avail: NTIS HC $3.75 CSCL 05B

Results are presented of an investigation of the form of the future system for the Earth Resources Program. System performance requirements for the total operational and research earth resources system in 1980's are defined along with critical research and technology development needs. The role of the space shuttle in the total system is emphasized. Conclusions are summarized. J.M.S.

N75-31557*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
GEOS-C GROUND TRUTH PROGRAM DESCRIPTION DOCUMENT
L. R. Goodman Mar. 1975 196 p refs
(NASA-TM-X-69359) Avail: NTIS HC $7.00 CSCL 08B

Models and plans for in situ measurements required to calibrate and evaluate the altitude and sea state measurement capabilities of the GEOS-C radar altimeter are presented. Author

N75-33096* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
REFURBISHMENT OF THE CRYOGENIC COOLERS FOR THE SKYLAB EARTH RESOURCES EXPERIMENT PACKAGE

Jerry C. Smithson and Norman C. Luksa *In its* 9th Aerospace Mech. Symp. 1974 17 p ref

CSCL 14B

Skylab Earth Resources Experiment Package (EREP) experiments, S191 and S192, required a cold temperature reference for operation of a spectrometer. This cold temperature reference was provided by a subminiature Stirling cycle cooler. However, the failure of the cooler to pass the qualification test made it necessary for additional cooler development, refurbishment, and qualification. A description of the failures and the cause of these failures for each of the coolers is presented. The solutions to the various failure modes are discussed along with problems which arose during the refurbishment program. The rationale and results of various tests are presented. The successful completion of the cryogenic cooler refurbishment program resulted in four of these coolers being flown on Skylab. The system operation during the flight is presented. Author

N75-33449*+ National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT: US STANDARD CATALOG NO. U-31
31 Mar. 1975 102 p
(NASA-TM-X-72881) Avail: NTIS HC $5.25; EROS Data Center, Sioux Falls, S. D., 57198 HC $1.25 CSCL 05B

N75-33470*# Federal Geological Survey, Hanover (West Germany).
MULTIDISCIPLINARY GEOSCIENTIFIC EXPERIMENTS IN CENTRAL EUROPE Final Report, Oct. 1972 - Sep. 1974
Dieter Bannert, Principal Investigator Sep. 1974 170 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(E75-10415; NASA-CR-143412; Rept-2) Avail: NTIS HC $6.25 CSCL 08B

The author has identified the following significant results. Studies were carried out in the fields of geology-pedology, coastal dynamics, geodesy-cartography, geography, and data processing. In geology-pedology, a comparison of ERTS image studies with extensive ground data led to a better understanding of the relationship between vegetation, soil, bedrock, and other geologic features. Findings in linear tectonics gave better insight in orogeny and ore deposit development for prospecting. Coastal studies proved the value of ERTS images for the updating of nautical charts, as well as small scale topographic maps. A plotter for large scale high speed image generation from CCT was developed.

N75-33472*# Maine Dept. of Transportation, Augusta.
MULTIDISCIPLINARY ANALYSIS OF SKYLAB PHOTOGRAPHY FOR HIGHWAY ENGINEERING PURPOSES Final Report, Aug. 1973 - Feb. 1975
Ernest G. Stoeckeler, Raymond G. Woodman, Principal Investigators, and Robert S. Farrell 28 Feb. 1975 115 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13359)
(E75-10417; NASA-CR-141942) Avail: NTIS HC $5.25 CSCL 13B

The author has identified the following significant results. The greatly increased resolution of ground features by Skylab as compared with LANDSAT is considered to be best in the S190B high resolution film, followed by S190A camera stations 4, 5, and 6 respectfully. Results of the study of vegetation damage sites using data derived from S190A film were disappointing. The major cause of detection problems is the graininess of the CIR film. Good results were achieved for the hydrology-land use study. Both camera systems gave better agreement with the ground truth than did LANDSAT imagery. Surficial geology and glacial landform areas were clearly visible in single scenes. Several previously unmapped or unknown features were detected, especially in eastern coastal Maine.

N75-33492# California Univ., Davis. Water Resources Center.
EVALUATION OF A PROBABILITY APPROACH TO UNCERTAINTY IN BENEFIT-COST ANALYSIS Completion Report
Lloyd J. Mercer and W. Douglas Morgan Apr. 1975 66 p refs
(PB-242370/5; Contrib-149; W75-08478;
OWRT-A-053-CAL(1)) Avail: NTIS HC $4.25 CSCL 13B

The application of the Weibull probability distribution to the problem of uncertainty in benefit-cost analysis was evaluated. Economy of information, versatility with regard to shape, ability to incorporate objective information, and ease of mathematical manipulation support the use of the distribution. Compared to range sensitivity tests, the only additional pieces of information required are the probabilities that the actual values of the variable will be less than the low or exceed the high of the range. The Weibull probability assignment technique was applied to four separate benefit-cost studies concerning water resources. The standard deviation and central tendency measures of the outcome distribution (net benefits, benefit-cost ratio, etc.) were determined, as well as the probability of an outcome indicating the project is not feasible. The results obtained indicate that the technique is a significant improvement over range sensitivity tests to resolve uncertainly in benefit-cost analysis. GRA

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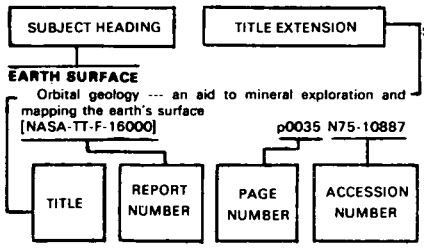

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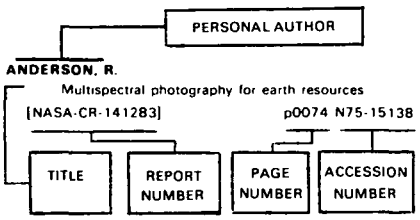

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CORPORATE SOURCE INDEX

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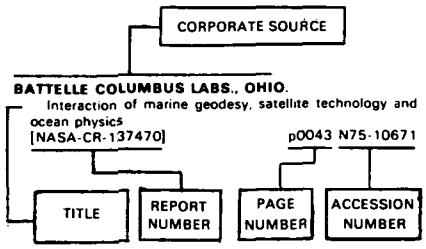

The title of the document is used to provide a brief description of the subject matter. The page number and the accession number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document.

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ACADEMY OF SCIENCES (USSR), MOSCOW.
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Earth resources data acquisition sensor study
[NASA-CR-143925] p0265 N75-30637

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Variations in the hydrographic structure of Prince William Sound
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Use of LANDSAT imagery for wildlife habitat mapping in northeast and east central Alaska
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Land use maps of the Tanana and Purcell Mountain areas, Alaska, based on Earth Resources Technology Satellite imagery
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Doppler translocation test program
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Applied Remote Sensing Program (ARSP) to state and local government
[NASA-CR-143456] p0227 N75-31553

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Inundation damage to vegetation at selected New England flood control reservoirs
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[AD-A011249] p0244 N75-33488

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ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
Application of remote sensors to Army facility management. Appendix B: Validation of environmental maps produced through air-photo interpretation
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ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER, CHARLOTTESVILLE, VA.
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[E75-10344] p0252 N75-28482
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Application of LANDSAT to the surveillance and control of lake eutrophication in the Great Lakes basin
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BOEING CO., KENT, WASH.
Quantitative determination of stratospheric aerosol characteristics
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BRITISH LIBRARY LENDING DIV., BOSTON SPA (ENGLAND).
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[BLL-M-23505-(5828.4F)] p0231 N75-28476
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A multidisciplinary study of earth resources imagery of Australia, Antarctica and Papua, New Guinea
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Crude oil spills research. An investigation and evaluation of analytical techniques
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[PB-241244/3] p0236 N75-28515

BUREAU OF MINES, TWIN CITIES, MINN.
Extracting minerals from geothermal brines: A literature study
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BUREAU OF RECLAMATION, DENVER, COLO.
Use of the LANDSAT-2 data collection system in the Colorado River Basin weather modification program
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CALIFORNIA EARTH SCIENCE CORP., SANTA MONICA.
Faults on Skylab imagery of the Salton Trough area, Southern California
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Ice drift in Robeson channel as determined using television moving target circuitry
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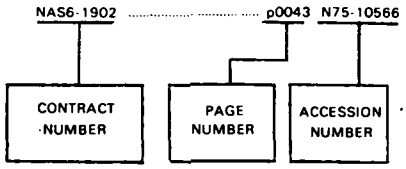

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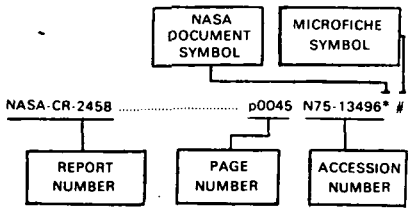

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EARTH RESOURCES A Continuing Bibliography (Issue 08)	April 1976
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
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National Aeronautics and Space Administration Washington, D. C. 20546	13. Type of Report and Period Covered
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15. Supplementary Notes

16. Abstract

This bibliography lists 351 reports, articles, and other documents introduced into the NASA scientific and technical information system between October 1975 and December 1975. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
Bibliographies Earth Resource Program Remote Sensors	Unclassified - Unlimited

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